BRITISH SUBMARINE VS ITALIAN TORPEDO BOAT

Mediterranean 1940–43

DAVID GREENTREE

Author

David Greentree graduated in History from the University of York before taking an MA in War Studies at King's College London and qualifying as a lecturer in Further Education. In 1995 he accepted a commission in the Royal Air Force and has served in a variety of locations, including Afghanistan and Oman.

Illustrators

Ian Palmer is a highly experienced digital artist. A graduate in 3D design, he currently works as a freelance art director in the games and film industries, and he has illustrated books for Osprey for more than a decade. Ian completed the torpedo-boat and submarine profiles, weaponry plates and periscope views for this book.

Peter Dennis was born in 1950. Inspired by contemporary magazines such as Look and Learn he studied illustration at Liverpool Art College. Peter has since contributed to hundreds of books, predominantly on historical subjects, including many Osprey titles. A keen wargamer and modelmaker, he is based in Nottinghamshire, UK. Peter completed the cover artwork and battlescene artwork for this book.

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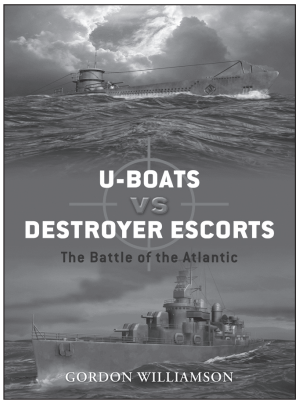
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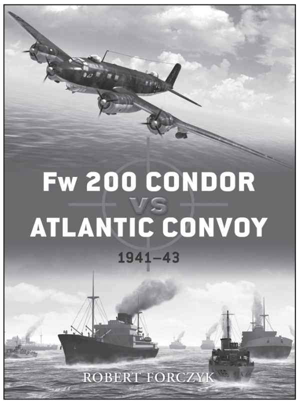
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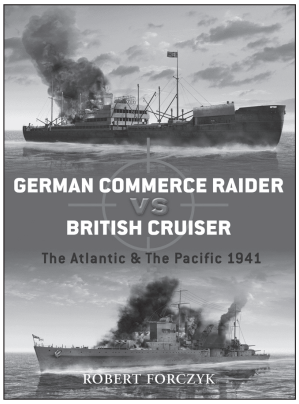
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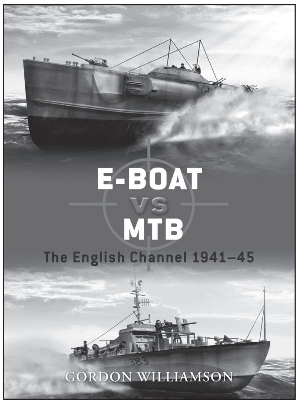
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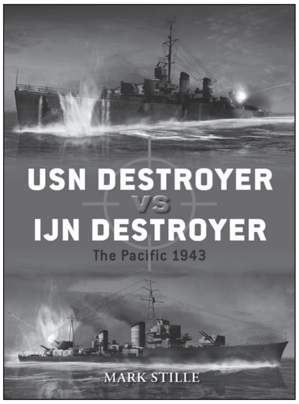
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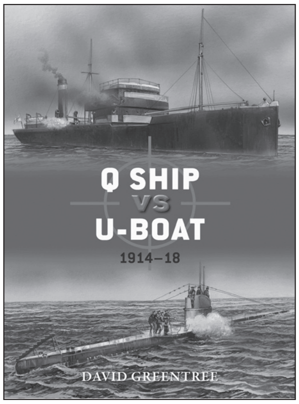
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Mediterranean 1940–43

DAVID GREENTREE

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COVER ART In December 1942, the U-class submarine *P 48* (above) was patrolling off Bizerte. *Ardente* (below) and *Ardito*, Ciclone-class torpedo boats, sailed from Palermo on 24 December escorting two merchant ships, *XXI Aprile* and *Carlo Zeno*. At 1120hrs on 25 December, 12 miles off Zembra Island in the Gulf of Tunis, 'a submarine asdic contact was obtained at 2,600 metres [2,845yd]'; 12 depth charges were used and the 'senior officer in Ardente [Tenente di Vascello Rinaldo Ancillotti], after waiting for a quarter of an hour for the disturbed water to subside, then regained contact' (quoted in Wingate 1991: 258). After the third attack with another 12 depth charges, 'the bridge sighted a confused "boiling" on the sea. Thinking that the submarine was about to surface, all guns were trained on this spot. But the boiling slowly subsided and when the echo from the submarine was again obtained, the target's position was stationary at a depth of 200 metres [650ft]' (quoted in Wingate 1991: 258). *Ardente* made another attack with a further 12 depth charges; in total, 48 were used.

TITLE PAGE On board his first submarine, Young was amazed at the 'complexity of pipes, valves, electric wiring, switches, pressure-gauges, junction-boxes, above our heads and on every side of us' (Young 2004: 19). He was told how air in the ballast tanks kept out the water and 'when we wanted to dive, the air would be let out of the vents which we could see along the tops of the tanks' (Young 2004: 20). Here, the control room of a submarine from the training flotilla in Portsmouth in 1937 is shown. (Cody Images)

Acknowledgements
I would like to thank Ted Nevill from Cody Images, Lorna Edwards, the author's cousin and niece of Leading Seaman George Bishop, the wireless operator on *Uproar* in 1942, and Capitano di Fregata Ennio Chiffi and the staff of the Ufficio Storico Marina Militare Italiana (USMM) for assistance with the research of images for the book. I had the pleasure to interview Captain M.L.C. 'Tubby' Crawford, DSC and Bar, RN, who was first lieutenant on HMS *Upholder* and commanded HMS *Unseen*. I am also grateful to Mark Zumpe at Portsmouth Central library and David Campbell for providing source material. Sonia Polverigiani also assisted with translating from the Italian.

Editor's note
In this book linear, weight and volume measurements are given in imperial units of measurement: nautical miles (referred to simply as 'miles'), yards, feet, inches, long tons and pounds. The exception is weapons calibre, where metric is used in some cases, depending on the context. Cargo capacity of merchant shipping is given in gross register tons (GRT), a measurement of cubic capacity rather than of weight. The following data will help when converting between imperial and metric measurements:

1 nautical mile = 1.85km
1yd = 91.44cm
1ft = 30.48cm
1in = 2.54cm
1 long ton = 2,240lb/1.016 tonnes
1lb = 0.454kg
1 GRT = 4.64ft^3/2.83m^3

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Comparative ranks

British	**Italian**
Admiral of the Fleet	N/A
Admiral	*Ammiraglio d'armata*
Vice admiral	*Ammiraglio di squadra*
Rear admiral	*Ammiraglio di divisione*
Commodore	*Contraammiraglio*
Captain	*Capitano di vascello*
Commander	*Capitano di fregata*
Lieutenant commander	*Capitano di corvetta*
N/A	*Primo tenente di vascello*
Lieutenant	*Tenente di vascello*
Sub-lieutenant	*Sottotenente di vascello*
Ensign	*Guardiamarina*
Midshipman	N/A
Chief petty officer	*Capo di 1a classe*
N/A	*Capo di 2a classe*
N/A	*Capo di 3a classe*
Senior petty officer	*Secondo capo*
Petty officer	*Sergente*
Leading seaman	*Sottocapo*
Able seamen	*Commune di 1a classe*
Ordinary seaman	*Commune di 2a classe*

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INTRODUCTION

At 0300hrs on 13 February 1942, the British submarine *Tempest*, waiting in the Gulf of Taranto to intercept an Italian convoy, suffered a depth-charge attack from the Italian torpedo boat *Circe*. Chief Petty Officer Charles Anscomb, on board *Tempest*, described 'a tremendous, gathering surge of clanging thunder…everything *shook* like an earthquake shock as if every atom in the ship's company were splitting. Then it was dark … Instruments were shattered, wheels locked, glass tinkled over the deck' (Anscomb 1957: 120). All the crew were told not to move, in order to conserve oxygen and also deceive the Italians' hydrophones (listening devices that detected noise emissions through water). With the submariners' own hydrophones out of action, Anscomb related the desperation of the situation on the submarine: 'we had no means of finding the bearing of our attacker … we couldn't dodge what he was throwing at us … I began to get that *this can't be happening to me* feeling' (Anscomb 1957: 121).

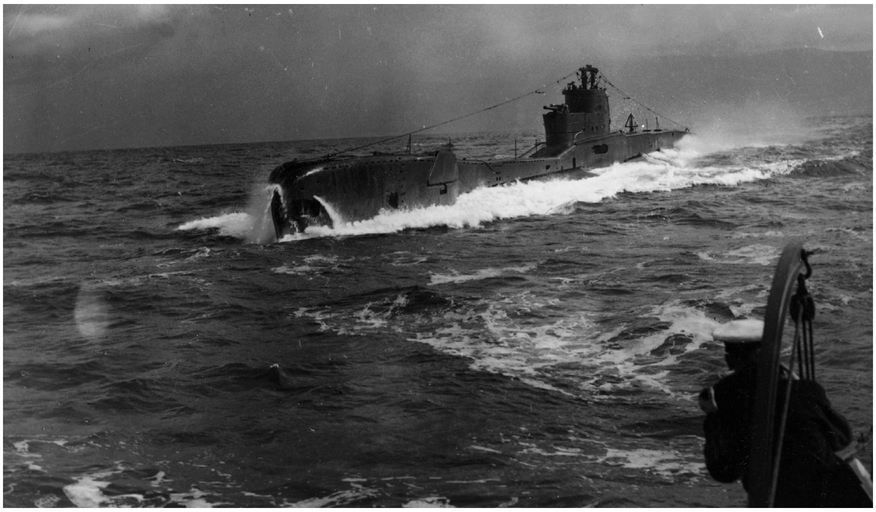
Tempest was deployed to interdict merchant ships heading to Libya with supplies for the Axis forces there. Such was the importance of torpedo boats to escorting these convoy operations that by late 1942 many Italian destroyers were serving as fuel bunkers for them. The Italian battle fleet could still theoretically be a potent threat, despite suffering losses in Taranto harbour (11–12 November 1940) and off Cape Matapan (27–29 March 1941), but fuel shortages inhibited its future deployment. Indeed, the need to replenish diminishing oil stocks and deny them to the enemy had brought about the German offensive against the Caucasus oilfields in Russia, and the Axis campaign in North Africa was also focused on an offensive to capture Suez and the Middle Eastern oilfields beyond.

Capitano di Vascello Aldo Cocchia, commanding 16a Squadriglia Cacciatorpediniere based at Messina on Sicily, related how the protection of convoys was an unrelenting 'battle in which there were no pauses or intervals of rest' (Cocchia 1958: 116).

The Spica-class vessel *Climene* is shown here in its early-war colours. The protection of the supply lines to North Africa would turn out to be the primary role of the Regia Marina (Italy's navy) in World War II. Before the war, some older destroyers were re-roled as torpedo boats and four Orsa-class vessels – bespoke escorts – were built. The Regia Marina's planning department wanted to rely on torpedo boats as escorts and in 1937–40, 32 Spica-class torpedo boats were laid down, the first since 1919, and were joined by 16 Ciclone-class vessels during the war. By 1942, 60 smaller Gabbiano-class corvettes were also planned. The Royal Navy's role was to interdict Axis supply convoys, and Malta was the base from which the small U-class submarines operated. Other, larger submarines based in Egypt and Gibraltar would also play their part; submarines were vulnerable in clear, shallow waters, however, and in total 40 would be lost in the Mediterranean – ten to Italian torpedo boats – before the Italian Armistice of 8 September 1943. (USMM)

Convoys to North Africa were numerous because 'the sea-route was so short, and partly because of the limited berthing capacity of the Libyan ports' (Cocchia 1958: 119), having an average of 2.2 escorts and 1.9 merchantmen (with an average displacement of 4,100 GRT); also, ships 'were tied down to the narrow stretch of water between their ports of arrival and departure' and in the centre 'was a well-equipped enemy base' – the island of Malta – around which every day 'At least one convoy – and often more than one – had to pass' (Cocchia 1958: 117). Britain used radar-equipped aircraft, which 'had no difficulty picking up our convoys, especially since they knew that something was bound to be there' (Cocchia 1958: 117), and – unknown to the Italians – were decoding German Enigma communications that gave details on composition, times and routes. Britain benefited from this intelligence and sent submarines, aircraft and sometimes surface ships. As a result, a typical convoy on the route from Taranto to Benghazi, for example,

> usually suffered its first attack from submarines patrolling off the Italian coast. It was then picked up by radar in the Ionian Sea and hammered for the entire night by bombers and torpedo-carrying aircraft. These were usually joined by submarines patrolling in the approaches to Benghazi and directed to the scene … Finally, there were further attacks by enemy aircraft and submarines off the African coast. (Cocchia 1958: 117)



Here is *Thorn*, a T-class Group II boat that would be sunk by the Italian torpedo boat *Pegaso* on 6 August 1942 (see page 45). The periscopes on *Thorn* were only 34ft long and because periscope depth was 30ft the first lieutenant's efforts to maintain trim were complicated, especially as some T-class boats experienced problems maintaining submerged depth at 30ft. Only *Tetrarch* was refitted with a 40ft periscope as the cost of refitting them all was prohibitive. (Author's collection)

CHRONOLOGY

1922

6 February	Alongside the United States, Japan and France, Britain and Italy sign the Washington Naval Treaty; British efforts to ban submarines altogether are unsuccessful, and no agreement is reached about limiting their numbers.

1930

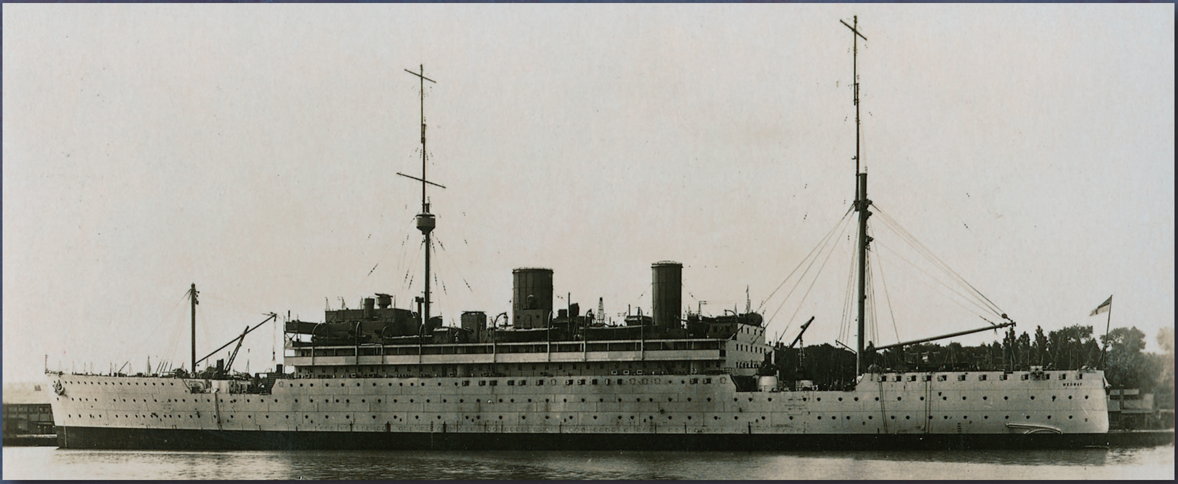
22 April	The same five powers sign the First London Naval Treaty; submarine displacements and gun calibres are restricted, and international law is deemed to apply to submarines as well as surface ships.

1936

25 March	France, Britain and the United States sign the Second London Naval Treaty, limiting submarines to 2,000 tons and guns of less than 5.1in; Japan and Italy decline to sign.

1940

February	Britain breaks Germany's Enigma code for the first time.
16 May	The British Admiralty closes the Mediterranean to normal merchant traffic.
10 June	Italy declares war on France and Britain; Italian air attacks on Malta commence.
14 June	Italian destroyers *Strale* and *Baleno* sink *Odin*, the first British submarine to be sunk by the Italians.
16 June	*Polluce* is the first Italian torpedo boat to sink a British submarine, sinking *Grampus* off Augusta, Sicily.
13 September	Italian ground forces cross into Egypt and advance to Sidi Barrani.
11–12 Nov	British torpedo bombers attack the Italian battle fleet in Taranto harbour; half of the fleet is disabled.
December	Germany's X. Fliegerkorps deploys to Sicily.



According to submarine skipper Lieutenant Alastair Mars, the depot ship *Maidstone* was 'a floating dockyard equipped with torpedoes, ammunition, water, oil, food, spare parts and all the essentials for repair work' (Mars 2008: 32). Another depot ship, *Medway* (shown here), was sunk in 1942 on her way to Beirut, but half of the torpedoes had already been sent ahead by road. Charles Anscomb thought *Medway* 'compared with previous ships of her type was the very last word in comfort' (Anscomb 1957: 89). Submarine patrol length was limited to about three weeks because of the supplies the submarine carried – only two weeks' worth on the smaller U-class boats. The larger boats carried more, but also consumed more and had more mechanical issues. Submarines were sometimes non-operational due to faults. Inspections and repairs were due on average twice a year, which for Chief Engine Room Artificer Joel Blamey 'included refitting all hull valves, renewing the anti-corrosion zinc plates of which there were hundreds, changing propellers and removing hydroplanes, as well as scraping and painting the hull and external main ballast tanks' (Blamey 2002: 22). (Author's collection)

Senior officers of the Regia Marina inspect a ship's complement. In the early 1930s, the Italian naval chief-of-staff, Ammiraglio d'Armata Gino Ducci, realized that escort ships were 'vital in the defence of national communications in time of war' (quoted in Sadkovich 1994: 11), but his successor, Ammiraglio d'Armata Domenico Cavagnari (naval chief-of-staff 1934–40), prioritized battleships in the 1934 naval programme, despite debates about their continued utility at a time when some strategists preferred smaller surface vessels and submarines supported by aircraft. After the Great Depression of 1929–34, funds were limited and by default money was available for smaller ships; in 1935 Cavagnari requested additional smaller ships, including torpedo boats, to protect lines of communication. (Author's collection)

8 December	British ground forces advance to El Agheila in Libya.

1941

January	X. Fliegerkorps starts bombing Malta.
February	Elements of the Deutsches Afrikakorps starts to arrive in Tripoli; by April the British have been pushed back to the Egyptian border and Axis forces have besieged Tobruk.
27–29 March	At Cape Matapan, Greece, a British fleet sinks three Italian heavy cruisers and damages the battleship *Veneto Vittorio*.
6 April–1 June	In response to Germany's invasion of Greece, British forces are deployed and then evacuated from Greece and Crete.
Late April	X. Fliegerkorps begins to depart Sicily.
September	Britain's 10th Submarine Flotilla, commanded by Captain G.W.G. Simpson, is formed on Malta.
Oct–Dec	22 German U-boats arrive in the Mediterranean and a base is established at Salamis in Greece to interdict supplies bound for Allied forces besieged in Tobruk.
November	A British counter-attack relieves Tobruk and by the end of December reaches El Agheila.
19 December	Italian frogmen using 'human torpedoes' severely damage two British battleships in Alexandria harbour in Egypt.

1942

January	Axis ground forces advance to the Gazala Line and both sides build up their forces there.
Late April	The 10th Submarine Flotilla moves from Malta to Haifa in British Palestine.
June	Axis ground forces push into Egypt, reaching El Alamein, where they are stopped. Invasion of Malta is indefinitely postponed.
July	*Unbroken* is the first submarine to return to Malta.
Oct/early Nov	Axis forces are driven out of Egypt after the second battle of El Alamein.
8 November	The Allied invasion of French-occupied North Africa begins.
20 November	The Axis siege of Malta ends as convoys arrive safely.

1943

12 May	Axis forces in North Africa surrender.
10 July	The Allies invade Sicily.
28 August	*Ultor* torpedoes the beached *Lince* in the Gulf of Taranto.
3 September	Allied forces land on the Italian mainland.
8 September	The Italian Armistice is announced. Some Regia Marina elements surrender to the Allies while others are captured by the Germans.

DESIGN AND DEVELOPMENT

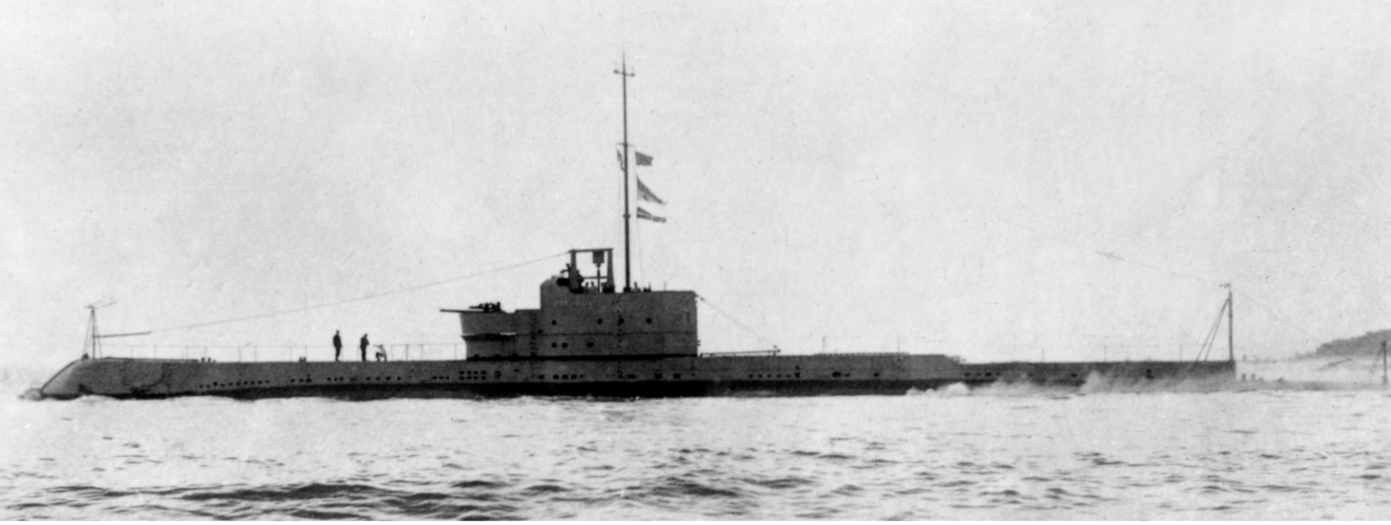
BRITISH SUBMARINES

ORIGINS

From 1918 to 1922, British submarine strength fell from 138 to 55 boats. Having experienced unrestricted submarine warfare by German U-boats against commerce during World War I, British politicians wanted to abolish submarines in the interwar period. They believed that the surface fleet would still dominate the battle for command of the sea, but for financial reasons from 1926 new submarines were built to provide, instead of surface ships, the major fleet presence in the Far East; in this theatre, the requirement was for large boats capable of long-range patrolling and with a heavy torpedo armament to attack enemy naval units. The O, P and R classes were patrol submarines that could reload six torpedoes in 7 minutes and practised torpedo attacks on battleships protected by destroyer screens. Submarines would manoeuvre in close formation on the surface and move 1 mile apart submerged. The first submarine to make contact would lead the escorts away and the others would attack. The priority had changed from intercepting merchant ships to attacking warships, and such was the focus on operations against warships that submarines were also designed with a high surface speed to accompany the fleet.

THE O, P, R AND RIVER CLASSES

In 1926, the O-class submarine was commissioned; three – *Oberon*, *Otway* and *Oxley* – were built before marginal improvements were incorporated from 1929 in the six



Orpheus, shown here, would probably be sunk by a mine on 19 June 1940. According to Captain George Villar, an engineer based at HMS *Dolphin* in the 1930s, the O-class boats were 'totally unsuited to the rigours of war' (quoted in Kemp 1990: 7). Although equipped with ASDIC and two stern as well as six bow torpedo tubes, their engines and electrical systems required long and regular maintenance. Lieutenant John Wingate thought the larger submarines 'were not merely out-dated, but too cumbersome and unwieldy to be effective in this theatre of war'; rather 'smaller, more manoeuvrable submarines, particularly for the shallow, inshore waters where manoeuvrability was all-important' (Wingate 1991: 7) were better suited. Sub-Lieutenant Edward Young RNVR was given a submarine experience in late May 1940 on board *Otway* and was 'disappointed at the fragile and rattly appearance of this submarine … I was unaware that most of what I could see was a sort of outer shell which filled with water when the submarine dived' (Young 2004: 18). The O-class submarines were unreliable. In August 1941 *Osiris* was returning after a short patrol when both main motors failed, despite a recent refit at Chatham. The submarine made it back on diesels, but had to be towed into harbour when they too failed. (Cody Images)

Group II boats (*Odin*, *Olympus*, *Orpheus*, *Osiris*, *Oswald* and *Otus*). All of the latter group would serve in the Mediterranean during World War II; only *Osiris* and *Otus* would survive the war. Designed as ocean-going patrol submarines, the P class arrived in 1930; these boats were identical to those of the O class, but with a different bow shape. Six P-class boats were built, five of which – *Pandora*, *Parthian*, *Perseus*, *Phoenix* and *Proteus* – would serve in the Mediterranean; only *Proteus* survived. The R class followed in 1934, four of which – *Rainbow*, *Regent*, *Regulus* and *Rover* – were built; all fought in the Mediterranean, with *Rover* the sole survivor of the four. Although the engines of the O-, P- and R-class boats were capable of 17.5kn surfaced, they were mechanically unreliable, and riveted external fuel tanks outside the main pressure hull leaked oil at depth.

In addition, in 1929 a fleet submarine – the River class – with a surface speed of 22kn was designed to keep up with the battle fleet. Pressure-hull plating was reduced to increase speed, but diving depth was reduced from 500ft to 300ft. Twenty River-class boats were ordered, but only three (*Thames*, *Clyde* and *Severn*) were completed; *Clyde* and *Severn* served in the Mediterranean, and both survived the conflict.

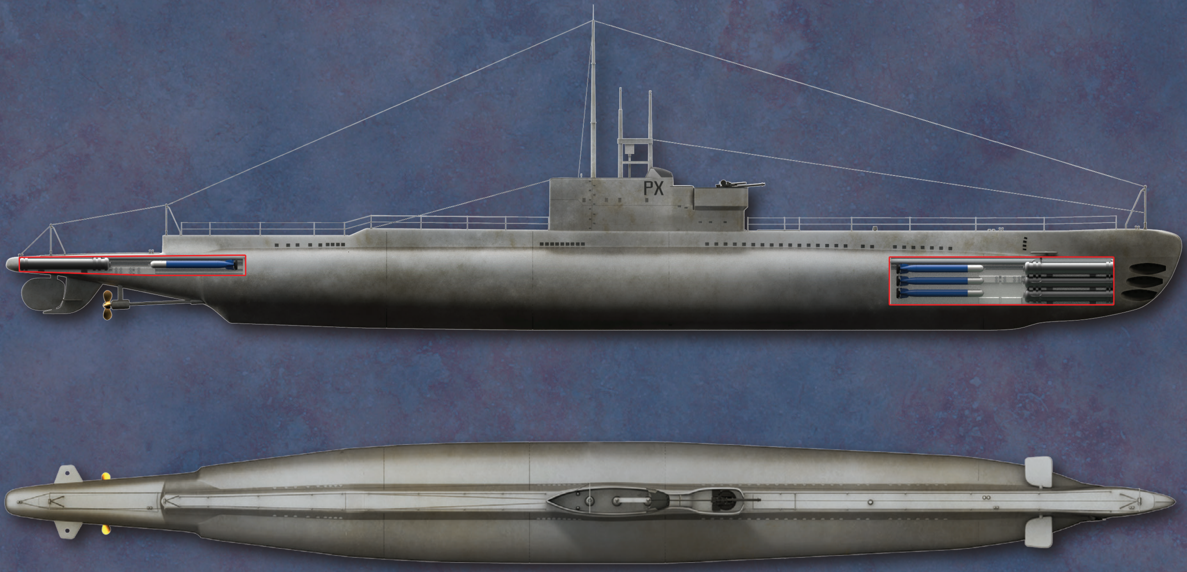
Maintaining external fuel tanks free from leaks was the priority for future designs and would lead to the S and T classes with fuel tanks within the pressure hull. New submarines also had to be smaller because of treaty restrictions. The 1930 London Naval Treaty restricted Britain to building new submarines of no more than 2,000 tons; new ocean-going submarines needed more torpedoes, however, to penetrate enemy destroyer screens equipped with improved anti-submarine warfare (ASW) technology.

THE S CLASS

The S class, designed for shallow waters, entered service in 1932 to replace the World War I-era H-class coastal submarine and because of restricted fuel capacity was only intended to operate in home waters, albeit against the full range of targets. The earliest S-class boats had a 3in gun and six torpedo tubes forward, but needed an oval rather than a circular hull to accommodate them, which reduced dive depth. Four Group I boats were followed by eight Group II boats; Group III boats, ordered from the beginning of the war (five in 1939, 20 in 1940 with 13 completed, 15 in 1941, 13 in 1942, and eight in 1943 with four completed), had increased diving depths and survivability from depth-charge attack because the pressure hull was welded.

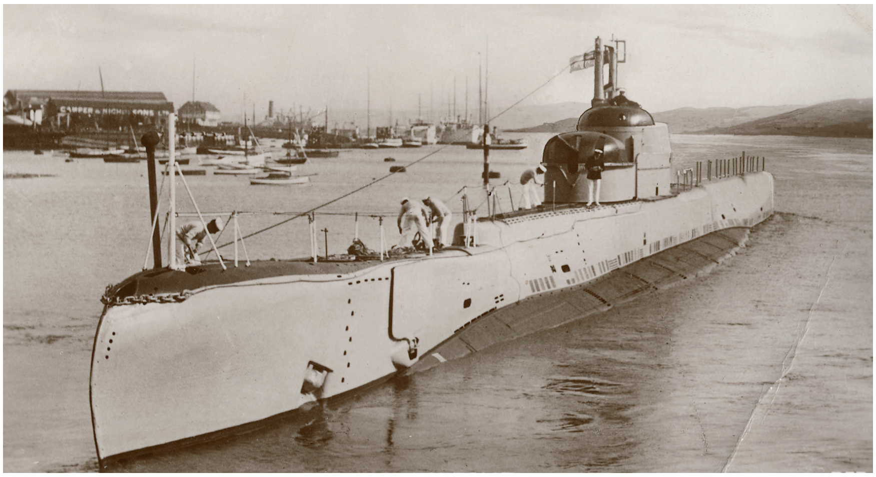
PHOENIX

The P-class boat *Phoenix* displaced 1,475 tons and was equipped with eight torpedo tubes (six in the bow and two in the stern) and a 4in deck gun. She was sunk by the Italian submarine chaser *Albatros* on 16 July 1940. Charles Anscomb, who served on *Parthian* in 1939–41, described these old boats as 'killer whales in a glass tank' (Anscomb 1957: 55); their silhouette made them easy to spot. The hydroplanes were old and temperamental. By the end of 1940, 11 of the old boats had been lost.



Furthermore, these boats had a 20mm cannon, an open rather than a closed bridge and an external stern tube, and many were fitted with a 4in instead of a 3in gun.

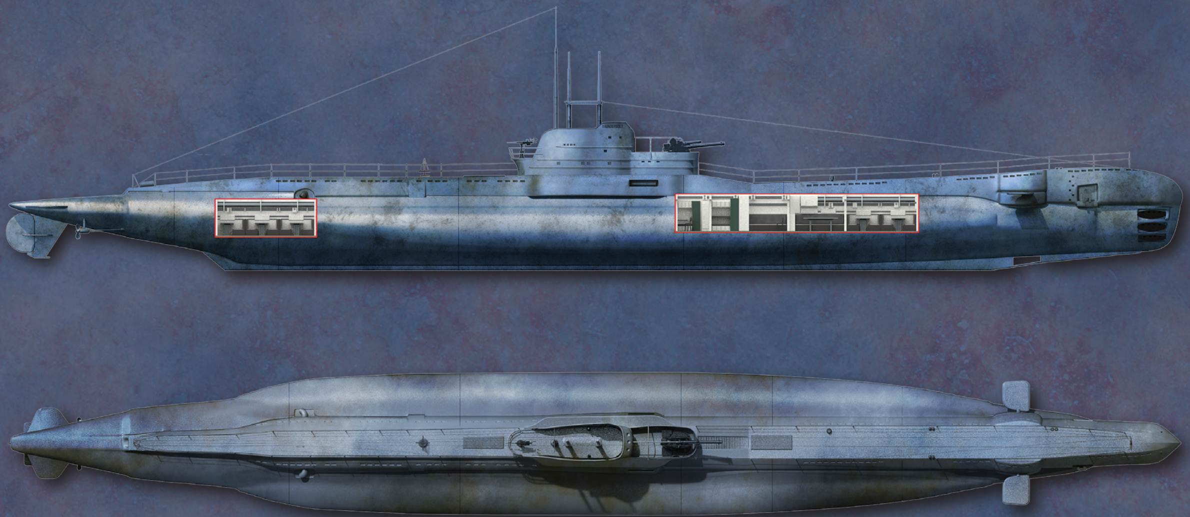
Only Group III boats – a total of 12 – would serve in the Mediterranean during World War II. Owing to the Admiralty's policy of giving numbers to newly built submarines until the end of 1942, when Prime Minister Churchill decided that all



In 1930 the Grampus class was ordered as minelayers, slightly slimmer than the overseas patrol boats and able to carry 50 mines outside the pressure hull. Six were built, with four – *Porpoise* (shown here), *Grampus*, *Rorqual* and *Cachalot* – serving in the Mediterranean; only *Rorqual* would survive. Armament was six torpedo tubes and a 4in gun. *Porpoise* was difficult to handle at periscope depth and on one occasion started to plummet when a tank was belatedly flooded as the submarine was submerging. The submarine went down to 350ft and experienced 155lb/in^2 of pressure on the hull (the Grampus class was worked for 110lb/in^2, permitting a dive depth of 300ft). The hull collapsed by 0.5in and the crew were ordered not to go deeper than 200ft in future. (Author's collection)

THUNDERBOLT

This illustration shows *Thunderbolt*, a T-class Group I boat. She entered service as *Thetis*, but sank on 1 June 1939 during trials and was salvaged, repaired and recommissioned as *Thunderbolt*. She had a distinguished career, latterly in the Mediterranean; she was sunk by the submarine chaser *Cicogna* off Sicily on 14 March 1943, with all hands lost. Of the 12 T-class Group I boats that served in the Mediterranean – *Taku*, *Talisman*, *Tetrarch*, *Thunderbolt*, *Tigris*, *Torbay*, *Triad*, *Tribune*, *Trident*, *Triton*, *Triumph* and *Truant* – only five would survive, namely *Taku*, *Torbay*, *Tribune*, *Trident* and *Truant*.

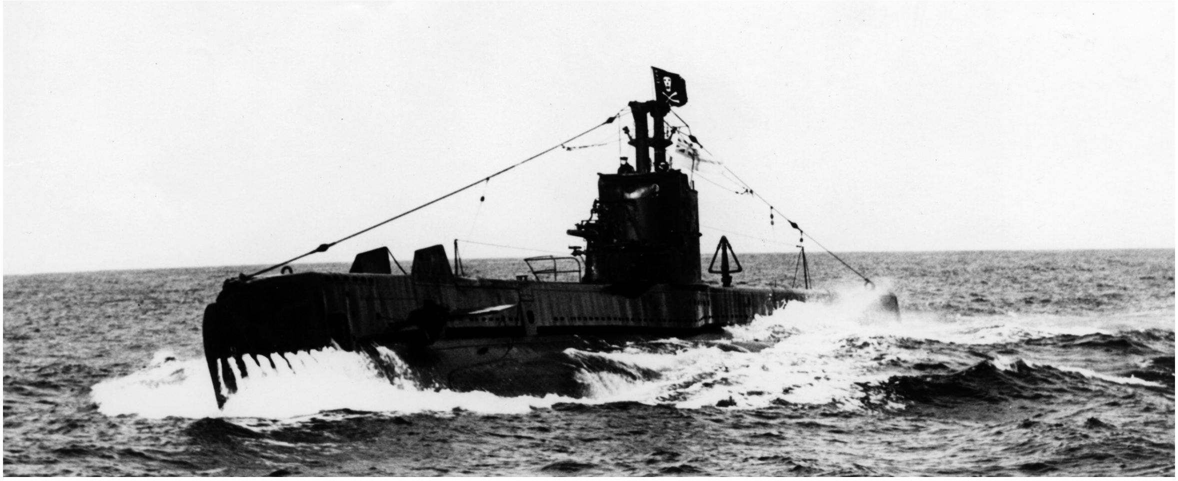


should have names, many served under two designations, and one – *P 222* – would be lost before a name could be assigned. The boats in question were *P 211* (later *Safari*), *P 212* (later *Sahib*), *P 247* (later *Saracen*), *P 217* (later *Sibyl*), *P 219* (later *Seraph*), *P 221* (later *Shakespeare*), *P 222*, *Sickle*, *Simoom*, *P 228* (later *Splendid*), *P 229* (later *Sportsman*) and *Surf*; the first three of these, like their fellow 1939 Programme boats, lacked the external stern tube. Six of the 12 – *Safari*, *Sibyl*, *Seraph*, *Shakespeare*, *Sportsman* and *Surf* – would survive the war.

THE T CLASS

T-class boats were seen as replacements for the old O, P and R classes that were long-range ocean-going boats. Accordingly, the initial requirement was for a boat displacing 1,000 tons, with six internal tubes, two external tubes, a 3in or 4in gun, and a diving depth of 300ft. The design – actually 1,327 tons surfaced (about 400 tons less than the O class) – was approved on 13 February 1936.

Ordered in 1935–38, the 15 Group I boats actually had ten torpedo tubes – two external in the bow, another two external amidships and six in the bow – with 16 torpedoes carried. Twelve of the boats served in the Mediterranean, namely *Taku*, *Talisman*, *Tetrarch*, *Thunderbolt*, *Tigris*, *Torbay*, *Triad*, *Tribune*, *Trident*, *Triton*, *Triumph* and *Truant*; five (*Taku*, *Torbay*, *Tribune*, *Trident* and *Truant*) survived the war. As a result of complaints regarding loss of speed due to the shape of the bows, the



After escaping from *Umpire* when the submarine collided with a trawler during sea trials with the 3rd Submarine Flotilla at Dunoon, Young moved to *P 247* (later *Saracen*), shown here, in early 1942 as first lieutenant, when the boat was still building. The boat spent two months on trials at Dunoon, where 'we rehearsed every imaginable situation … and practised emergency drills to cope with all foreseeable damage and breakdown' (Young 2004: 90) before carrying out a 'working-up' patrol. (Cody Images)

Admiralty decided to omit the bow external torpedo tubes from *Thunderbolt* and *Triumph*; for Group II boats the bow external tubes would be moved back by 7ft in order to help with sea keeping. A stern torpedo tube retrofitted to *Taku*, *Thunderbolt*, *Tigris*, *Torbay*, *Tribune*, *Trident* and *Truant* provoked debate; many thought it took up too much storage and accommodation space, and the torpedo department would be overworked if it was added.

Furthermore, *Truant*'s commander, Lieutenant Commander C. Hutchinson, reported in December 1939 that 'The bridge was found to be very exposed during the heavy weather experienced today … The constant shipping of heavy seas greatly impaired the efficiency of the OOWs [officers of the watch] and lookouts. Speed was reduced to avoid injury to personnel on the bridge' (quoted in Kemp 1990: 18). As a result, *Thunderbolt* and *Triumph* – as well as all Group II boats – were fitted with a cab structure on the front of the bridge. A 20mm Oerlikon gun was fitted on a bandstand mounted on the after-end of the conning tower on *Taku*, *Talisman*, *Thunderbolt*, *Tigris*, *Torbay*, *Trident* and *Truant*, and in 1943 a Type 291W radar was fitted to six of these boats (but not *Thunderbolt*) on a mast at the after-end of the periscope.

Seven Group II boats – *Tempest*, *Thorn*, *Thrasher*, *Traveller*, *Trooper*, *Trusty* and *Turbulent* – were ordered in 1939. The Group II boats added a stern torpedo tube fitted as standard and the external amidships tubes were moved aft of the conning tower and reversed to point to the stern. In *Tempest*, *Thorn*, *Thrasher*, *Trusty* and *Turbulent* the external amidships tubes were angled off 10 degrees so the torpedoes would avoid the saddle tanks. A larger flat area of casing appeared, however, which affected trim, and on *Traveller* and *Trooper* the angle was reduced to 7 degrees. All seven Group II boats would serve in the Mediterranean, with only *Thrasher* and *Trusty* surviving to be refitted with an open bridge, 20mm gun and radar.

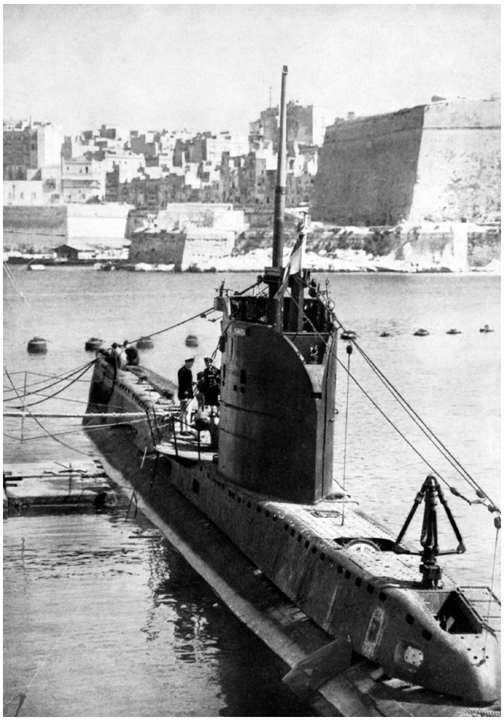
Group III boats had a welded rather than a riveted hull; of these, four – *P 311*, *Tactician*, *Taurus* and *Trespasser* – would fight in the Mediterranean before the Italian Armistice of 8 September 1943, with *P 311* being sunk before she received a name. Admiral Sir Arthur Johns, the Director of Naval Construction 1936–39, was not convinced of the Group III boats' merits and thought 'With welding the human element is much more critical than with riveting. A welder producing inferior work would prejudice the standard of production of the whole submarine' (quoted in Kemp 1990: 21). Even so, the hull was stronger and allowed depths of 400ft; two ballast tanks were converted to fuel-oil stowage.

THE U CLASS

In 1934, Rear Admiral N.F. Laurence, Rear Admiral (Submarines), advocated the need for small, cheap submarines to assist surface ships in ASW training and able to have torpedo tubes for wartime use. The initial design was for a single-hull boat 191ft long and 16ft wide with fuel and ballast tanks inside the pressure hull. Standard displacement would be 540 tons, fully loaded 600 tons, and submerged 730 tons. An initial specification for four forward tubes was supplemented by two external bow tubes and a reload capacity of four torpedoes, and provision was made to mount a 3in gun. Three hydrophones, one on the aft of the conning tower and others each side of the bow, were installed, as was ASDIC on the keel for echo detection; an 8in bifocal periscope with high- and low-magnification settings and a 6in attack periscope could only be raised 12ft, however.

In late 1938, the three Group I boats – *Undine*, *Unity* and *Ursula* – entered service; they were slow on the surface (11.25kn), the bulbous casing forward created a substantial bow wave, and at periscope depth the vessels were easily discernible from a surface ship. *Undine* and *Unity* were sunk before the Mediterranean campaign started, but *Ursula* reached Gibraltar in October 1940 and survived the war; she retained her external tubes and was fitted with a 3in deck gun.

On 4 September 1939, 12 Group II boats were ordered; these mounted an ineffective 12-pdr gun, later replaced with a 3in gun on *Unbeaten* and *Unique*. *Unique*, *Upholder*, *Upright*, *Urge*, *Usk* and *Utmost* had the six tubes of the Group I boats, but at a meeting in January 1940 it was decided to omit the external torpedo tubes and dispense with the high bow. In order not to delay production, however, the six boats then being built – *Una*, *Unbeaten*, *Undaunted*, *Union*, *Urchin* and *Umpire* – retained the high bow but omitted the external torpedo tubes. Of the 12 Group II boats, ten would operate under British command in the Mediterranean alongside *Urchin*, rechristened *Sokół* and crewed by Polish mariners; *Umpire* had sunk following a collision only nine days after commissioning. Only *Sokół*, *Una* and *Upright* survived the war.



The 0.5in-thick, 191ft-long pressure hull on the U-class boats withstood pressure at a depth of 250ft. A metal covering with free-flooding holes provided a stable platform for the gun crew, who manned a 12-pdr gun of a type described by Mars as 'toys of little use against anything bigger than rowing boats' (Mars 2008: 104). The battery cells were vulnerable to damage from air attack or depth-charging, and battery containers were strengthened with rubber envelopes and pads for each battery cell; even so, mechanical problems could occur. On *Unbroken*, when one of the two main batteries was contaminated by a leaky fuel tank, 112 cells – each weighing 550lb – had to be hoisted out and new ones fitted. Singing propellers were sometimes a problem; *Upright* and *Utmost* were delayed pending the results of propeller trials. In January 1943, on *Unbroken* the propeller started to sing but could not be replaced because there was no spare. When enemy ASDIC was audible, the port motor had to be stopped entirely because of the noise it made. Lieutenant J.F.B. Brown, *Unity*'s captain in October 1939, noted how he needed to be at full buoyancy to reduce the bow wave and how the engines made a loud noise. It was difficult to maintain trim with the U class and, according to Lieutenant M.L.C. 'Tubby' Crawford, 'when firing a full salvo of six torpedoes it was extremely hard to prevent the submarine from breaking surface' (Crawford 1972: 76). (Cody Images)

British submarine classes in the Mediterranean, 1940–43: basic specifications				
Class	**Displacement (surfaced/ submerged)**	**Length**	**Beam**	**Crew**
O class Group II	1,781/2,030 tons	283.5ft	30ft	54
P class	1,760/2,040 tons	289ft	30ft	53
R class	1,763/2,030 tons	287ft	30ft	53
River class	2,206/2,723 tons	345ft	28.3ft	61
Grampus class (*Porpoise*)	1,768/2,035 tons	289ft	29.9ft	59
Grampus class (other)	1,810/2,157 tons	293ft	25.5ft	59
S class Group III (1939)	865/990 tons	217ft	28.7ft	48
S class Group III (other)	890/990 tons	217ft	28.7ft	48
T class Group I (*Triton*)	1,300/1,595 tons	277ft	26ft	56
T class Group I (other)	1,300/1,595 tons	275ft	26ft	56
T class Group II	1,327/1,571 tons	274ft	26.5ft	61
T class Group III	1,327/1,571 tons	273ft	26.5ft	63
U class Group I	630/730 tons	191ft	16.1ft	31
U class Group II (1939 I)	630/732 tons	191ft	16ft	33
U class Group II (1939 II)	630/732 tons	197ft	16ft	33
U class Group II (1940–41)	658/740 tons	197ft	16ft	33

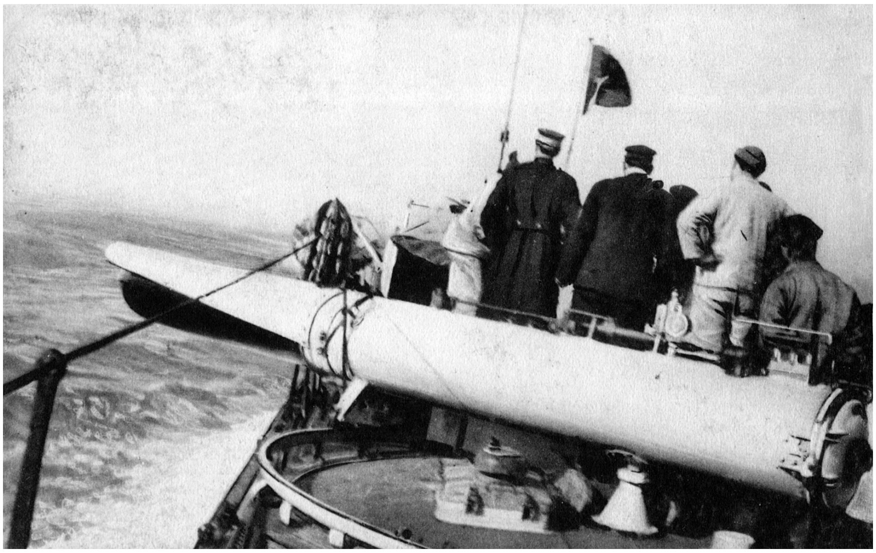
Another 22 Group II boats were ordered in 1940, of which 19 served in the Mediterranean. As with the S-class *P 222* and the T-class *P 311*, most of these boats initially operated under their numbers before Prime Minister Churchill ordered that all submarines should receive names, with six of those fighting in the Mediterranean – *P 32*, *P 33*, *P 36*, *P 38*, *P 39* and *P 48* – being lost before having their names officially assigned. Thirteen boats – *P 31* (later called *Ullswater* from February 1943 and then *Uproar* from April 1943), *P 34* (*Ultimatum*), *P 35* (*Umbra*), *P 37* (*Unbending*), *P 42* (*Unbroken*), *P 43* (*Unison*), *P 44* (*United*), *P 45* (*Unrivalled*), *P 46* (*Unruffled*), *P 49* (*Unruly*), *P 51* (*Unseen*), *Ultor* and *Unshaken* – survived the war.

In 1941, 12 more Group II boats were ordered; five – *Universal*, *Unsparing*, *Unswerving*, *Upstart* and *Usurper* – served in the Mediterranean before the Armistice, with all save *Usurper* surviving the war.

ITALIAN TORPEDO BOATS

ORIGINS

The doctrinal priority – either to build escort ships or submarine chasers – changed substantially throughout the 1930s and never seemed to be resolved. Based on early studies, the Regia Marina did not expect to sink any submarines; instead, a preventative strategy was adopted with escorts for convoys: 32 such ships would be built, each with



The Italians had a long tradition of operating short-range sea-going torpedo boats dating back to before 1914, as can be seen in this 1920s photograph. During World War I the Italians emphasized the use of small units such as submarines, torpedo boats, motor torpedo boats and minelayers, and deployed over 300 ships in anti-submarine warfare (ASW) operations, many of them small craft equipped with 47mm guns and depth charges. The Pegaso-class torpedo boats, built in 1904–09 from a design licensed by Thornycroft, were equipped with two 57mm guns, one 47mm gun and three torpedo tubes. The six Sirio-class and four Orione-class vessels were similar builds and all gave service during World War I. Few advances were made in the interwar years, however. The limitations on the use of submarines agreed by international treaty persuaded many that they would not be a danger, and expectations of a short war hampered funding for escorts. Italian studies conducted in 1925 concluded that within an area of 400 square miles a submarine would be found in two hours, without the help of aircraft; this assessment – according to torpedo-boat veteran Vitaliano Rauber, the official historian – was excessively optimistic. The Spica class would effectively replace the World War I-era Ardito-class vessels and six similar Indomito-class vessels. The Rosolino Pilo-class vessels and subsequent classes were developments of the Indomito class and would still be serving in World War II. (Author's collection)

two 100mm guns, depth-charge throwers, sensors and an engine capable of generating 22kn (which resulted in the Spica class). The plans and operations department suggested that a committee investigate the merits of larger ships of 1,000–1,200 tons equipped with sonar, an aircraft on a catapult, and depth-charge throwers (the Orsa-class escorts); there were issues with the aircraft, which were dependent on good weather because of the instability of the platform.

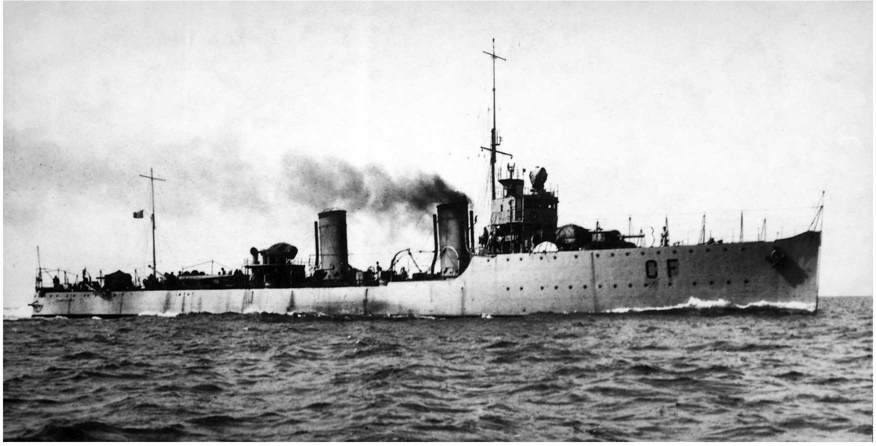
In 1937 a study found the C-tube hydrophone to be unsuitable and recommended the installation of sonar (known as ECG – *ecogoniometro* – by the Italians) on ASW ships; it concluded that a systematic ASW offensive was not an option because specialist ships did not exist, and in response the Regia Marina proposed to commission trawlers as auxiliaries. One torpedo boat would operate with four of these ships.

In October 1938 a study assessed the danger posed to maritime traffic by submarines and aircraft, and recommended the construction of 32 submarine chasers and 40 escorts (later reduced to 18 and eight, respectively). On 20 May 1940 a government report stated that a systematic ASW naval capability did not exist, which was a dangerous state of affairs given the potential threat of 60 Allied submarines; instead, building fishing boats specifically for ASW work was suggested. A note in the margin by a naval officer stated that this suggestion was ridiculous.

Only in 1940 did the document SAS T/9-4 state that sonar was indispensable; also, the importance of speed was stressed. SAS T/9-5 called for the establishment of an ASW centre in Taranto (on 1 August 1941 an ASW command, Ispettorato Antisom, would begin to operate), and the construction of smaller submarine chasers of 500 tons equipped with surveillance equipment (later the Gabbiano-class corvette); the ability to search and fight was again advocated.

OLDER TORPEDO BOATS

Italian destroyers were short-range ships that suffered from poor stability and a lack of torpedo tubes. On 1 October 1929, the former 'three-stacker' destroyers (*cacciatorpediniere*) of the Rosolino Pilo, Giuseppe Sirtori, Giuseppe La Masa and

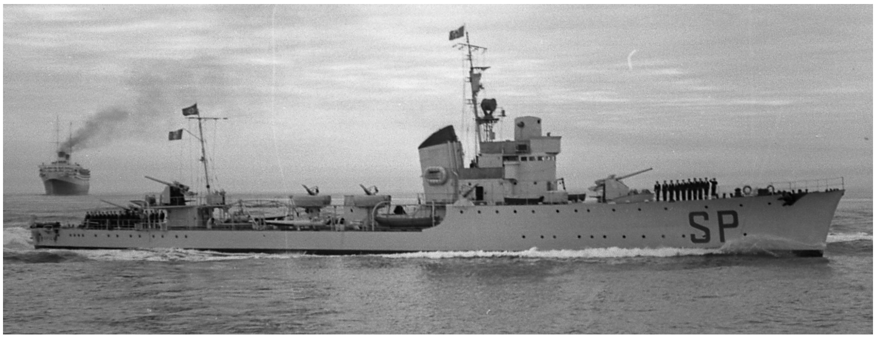


This photograph shows *Confienza*, a Palestro-class torpedo boat. Built from 1917, the four Palestro-class vessels (*Confienza*, *Palestro*, *San Martino* and *Solferino*) were armed the same as *Giuseppe La Masa*. The Curtatone class vessels (*Calatafimi*, *Castelfidardo*, *Curtatone* and *Monzambano*), built during 1920–24, were armed with two twin 4in/45 guns each. (Author's collection)

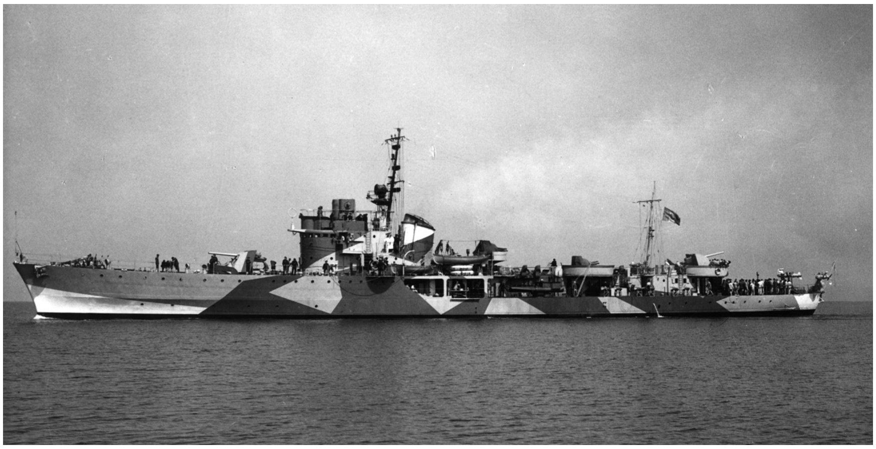
Generali classes were reclassified as torpedo boats (*torpediniere*), as was *Audace*, launched in 1916; under German command, she would be sunk by the British destroyers *Wheatland* and *Avon Vale* in the Adriatic on 1 November 1944. On 1 October 1938, the eight larger and more modern 'two-stackers' of the Palestro and Curtatone classes were also reclassified.

The seven surviving Rosolino Pilo-class vessels (*Antonio Mosto*, *Fratelli Cairoli*, *Giuseppe Dezza*, *Giuseppe Missori*, *Giuseppe Cesare Abba*, *Rosolino Pilo* and *Simone Schiaffino*) were built in Genoa during 1913–16. Each was initially armed with five 4in/35 guns and two 17.7in torpedo tubes; during 1941–43 the number of 4in guns was reduced to either three or two, and either five or six 20mm/65 guns were added. The four Giuseppe Sirtori-class vessels (*Francesco Stocco*, *Giovanni Acerbi*, *Giuseppe Sirtori* and *Vincenzo Giordano Orsini*) were built during 1916–17; they were initially armed with six 4in/45 guns, but were modified during World War II in similar ways to the Rosolino Pilo-class vessels.

The seven Giuseppe La Masa-class vessels (*Angelo Bassini*, *Enrico Cosenz*, *Giacinto Carini*, *Giacomo Medici*, *Giuseppe La Farina*, *Giuseppe La Masa* and *Nicola Fabrizi*), built during 1916–19, each had two 76mm/40 guns (disembarked at the start of World War II and replaced by 20mm/65 guns) and four 4in/45 guns, apart from *Giacinto Carini* and *Giuseppe La Masa* which each had a single 4in/45 gun, four 20mm/65 guns and a triple 21in torpedo tube. Usually, two 17.7in torpedo tubes were standard. The Generali class vessels (*Generale Antonino Cascino*, *Generale Achille*



By the 1930s, Italian torpedo boats used in World War I were being phased out and a replacement was needed. The Spica class, named after characters from ancient mythology, were designed in 1930–32 by Generale del Genio navale Gustavo Bozzoni and would perform better as escorts rather than interceptors. According to the historian James Sadkovich, torpedo boats 'were hybrid, lacking the punch of destroyers, not quite adequate for convoy defense, and too big to function as MAS [motor torpedo boats]'; lack of radar 'limited their effectiveness at night, and their lack of armament made them vulnerable to aircraft and other light vessels'; they proved 'remarkably resilient', however (Sadkovich 1994: 19–20), with *Perseo* completing 81 missions, *Circe* 79, *Climene* 100 and *Lupo* 130. Here is *Spica*, which – along with *Astore*, the other prototype – was armed with three 100mm/47 guns and four 17.7in torpedo tubes, and was capable of 34kn. Both *Spica* and *Astore* entered Swedish service in March 1940. (USMM)



The Ciclone class were improved Orsa-class escorts. By October 1940, 12 – later increased to 16 – had been ordered, to be built in batches of four: *Aliseo*, *Ghibli*, *Groppo* and *Monsone* at Castellammare di Stabia; *Animoso*, *Ardente*, *Ardimentoso* and *Ardito* at Genoa; *Ciclone* (shown here), *Fortunale*, *Tifone* and *Uragano* at Trieste; and *Impavido*, *Impetuoso*, *Indomito* and *Intrepido* (this last not completed at the time of the Armistice) at Riva Trigoso. Beam was increased to 32.5ft to improve seaworthiness, and provision was made for a third 100mm/47 gun (fitted – but later removed – on *Ghibli*, *Impavido*, *Impetuoso*, *Indomito* and *Monsone*, each of which had four twin 20mm/65 guns). Along with two 100mm/47 guns, *Aliseo*, *Ardente*, *Ciclone*, *Fortunale*, *Groppo*, *Tifone* and *Uragano* each had five twin 20mm/65 guns; *Animoso*, *Ardimentoso*, *Ardito* and *Intrepido* each had one quad and four twin 20mm/65 guns. (USMM)

Papa, *Generale Antonio Cantore*, *Generale Antonio Chinotto*, *Generale Carlo Montanari* and *Generale Marcello Prestinari*), built during 1919–22, were repeats of *Giuseppe La Masa*, each armed with three 4in guns.

THE SPICA AND ARIETE CLASSES

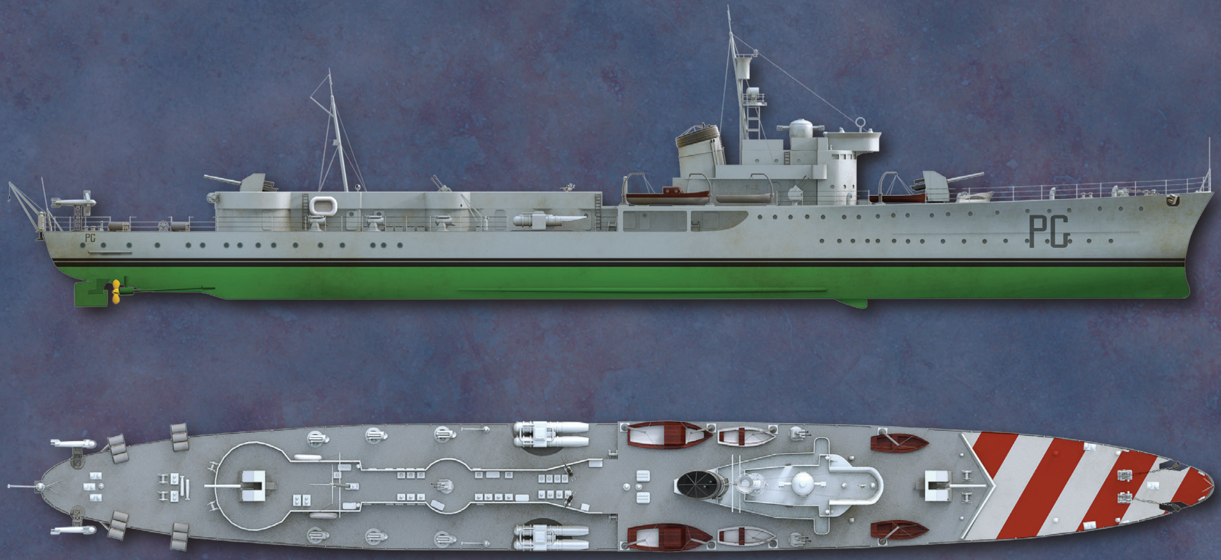
The First London Naval Treaty of 1930 permitted any number of small vessels under 600 tons to be built. In 1935, prototypes of the Spica class (*Spica* and *Astore*) were completed, each actually displacing 720 tons. Six more vessels (the Climene group: *Castore*, *Centauro*, *Cigno*, *Climene*, *Canopo* and *Cassiopea*) were completed in 1936–37,

Italian ASW vessel classes in the Mediterranean, 1940–43: basic specifications

Class	Displacement (standard)	Displacement (maximum)	Length	Beam	Complement
Rosolino Pilo class	770 tons	912 tons	239.5ft	24ft	69–79
Giuseppe Sirtori class	790 tons	850 tons	241ft	24ft	84–85
Giuseppe La Masa class	785 tons	851 tons	241ft	24ft	78
Generali class	730 tons	870 tons	241ft	24ft	118
Palestro class	875 tons	1,076 tons	268.7ft	26.2ft	118
Curtatone class	953 tons	1,214 tons	277.9ft	26.2ft	117
Albatros	408 tons	490 tons	231.3ft	22.6ft	187
Spica class Climene group I	780 tons	995 tons	269ft	26.9ft	99
Spica class Climene group II	780 tons	995 tons	263.8ft	26.9ft	99
Spica class Perseo group I	775 tons	1,005 tons	269ft	26.9ft	99
Spica class Perseo group II	775 tons	1,005 tons	263.8ft	26.9ft	99
Spica class Alcione group	785 tons	1,035 tons	263.8ft	25.9ft	99
Ariete class	745 tons	1,110 tons	274ft	28.2ft	150
Orsa class	1,000 tons	1,575 tons	293ft	31.8ft	154–168
Ciclone class	1,113 tons	1,683 tons	288.1ft	32.5ft	177
Gabbiano class	660 tons	728 tons	211.3ft	28.5ft	110

PEGASO

Reflecting changes in naval priority, Generale del Genio navale Gustavo Bozzoni was asked to design a new class of torpedo boat with improved ASW capability – the Orsa class. In 1936–38, *Orsa* and *Orione* were built at Palermo and *Pegaso* (shown here) and *Procione* at Napoli, designated as escort ships (*avvisi scorta*) instead of torpedo boats (*torpediniere*). In 1940, *Pegaso* was equipped with two depth-charge rails, six Lanciabombe 432 (three on each side), three twin 13.2mm cannon, two 8mm machine guns, two twin torpedo tubes, and two 100mm guns. By 1941, an additional two depth-charge rails were added and by 1942 six German depth-charge throwers Mod. G had replaced the Lanciabombe. In 1938, *Orsa* was fitted with experimental sonar, with the others receiving Italian sets only after Italy's entry into the war. In 1943, *Orsa* and *Orione* removed the main mast aft to improve the arc of fire of the cannon.

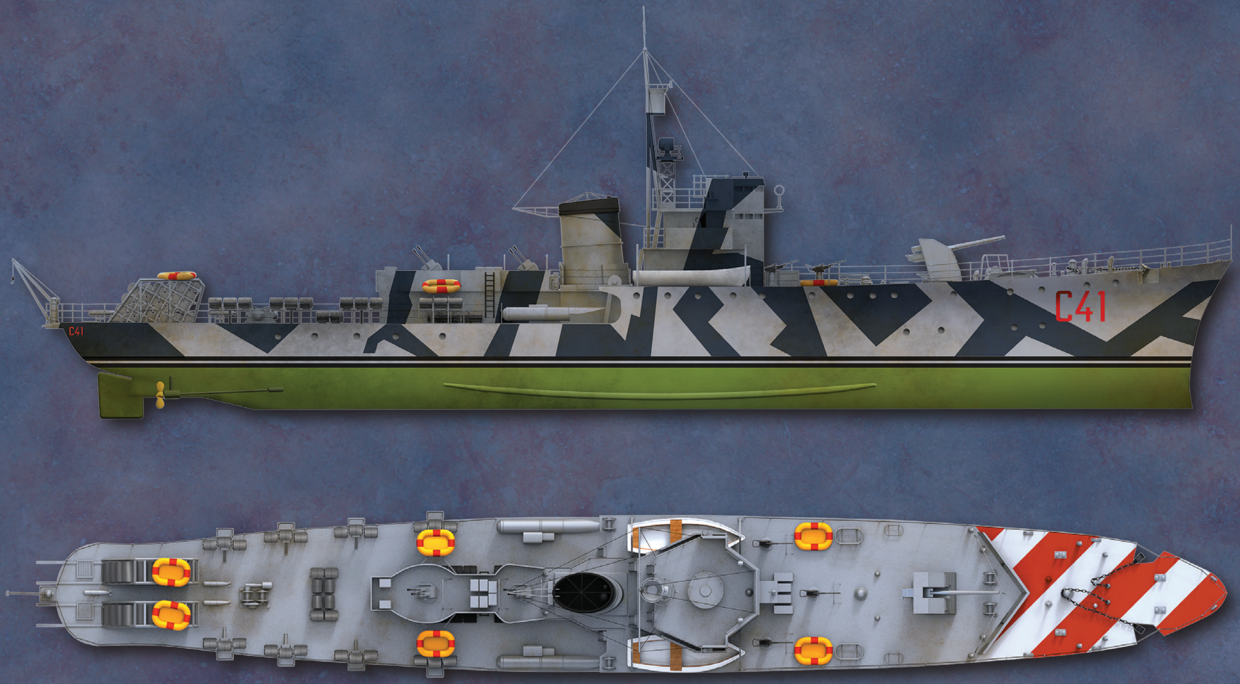


each with two single-mounted torpedo tubes on each side. The eight vessels of the Perseo group (*Perseo*, *Sagittario*, *Sirio*, *Vega*, *Aldebaran*, *Altair*, *Andromeda* and *Antares*) laid down in Genoa had the same torpedo-tube arrangement. Sixteen vessels of the Alcione group (*Alcione*, *Airone*, *Aretusa*, *Ariel*, *Clio*, *Calliope*, *Calipso*, *Circe*, *Libra*, *Lince*, *Lira*, *Lupo*, *Pallade*, *Partenope*, *Pleiadi* and *Polluce*) were commissioned in 1938 at Genoa, Fiume and Napoli. The Alcione-group vessels each had two twin torpedo tubes fitted on the centre line (allowing all to be fired at a single target), except the four built at Fiume (*Libra*, *Lince*, *Lira* and *Lupo*), which had four single torpedo tubes each; however, by 1941, all had disembarked the single tubes and replaced them with twin mounts. In addition, weaponry included 6–8 13.2mm machine guns in 3–4 twin mounts (replaced from 1939 by 6–10 20mm/65 cannon in three twin and four single mounts), and 2–4 depth-charge throwers. In 1941 sonar started to be fitted.

In 1941, six Ariete-class vessels were ordered by the government with the first, *Ariete*, laid down in July 1942 and launched in March 1943. These were improved

EUTERPE

The Gabbiano-class vessels were single-funnelled with a small superstructure, and the first to be built with an open fore bridge from where weapons were controlled by a small 2m-diameter range finder (a radio-direction-finding (RDF) goniometer rotated on a bracket ahead of the bridge). *Euterpe*, shown here, had one single 3.9in/47 gun forward and two single 17.7in torpedo tubes; not all Gabbiano-class vessels had these tubes. There were two twin 20mm guns on mountings aft of the funnel, and forward of the funnel there were three single 20mm guns. Four single depth-charge throwers on each side were each capable of launching three depth charges before reloading was necessary. There were two Gatteschi multi-level depth-charge racks side by side on the stern (each with 24 depth charges in six four-charge trolleys), spare depth charges and towed torpedoes on deck, and a towed torpedo ready to be launched on the stern. The sonar was in a spherical housing projecting 3.1ft under the keel.



Spica-class vessels that each had two 100mm guns plus six torpedo tubes in two triple mounts. Designs were first drawn up in 1936–37 for foreign sale, but no countries were interested. *Ariete* was commissioned on 5 August 1943, with the others still building at the time of the Armistice. Ten more laid down in 1942 were seized and completed by the Germans. *Ariete* fought with the Allies and survived World War II; she had ten additional 20mm/65 cannon fitted.

THE GABBIANO CLASS

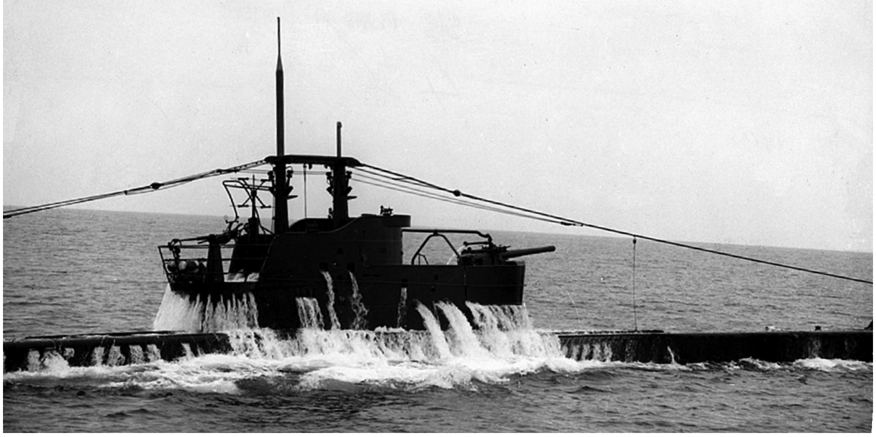
In the late 1930s, Generale Leonardo Fea designed the Gabbiano class as a submarine chaser (*corvette cacciasommergibili*). By September 1943, 29 had been commissioned: *Antilope*, *Ape*, *Artemide*, *Baionetta*, *Berenice*, *Camoscio*, *Chimera*, *Cicogna*, *Cormorano*, *Danaide*, *Driade*, *Euterpe*, *Fenice*, *Flora*, *Folaga*, *Gabbiano*, *Gazzella*, *Gru*, *Ibis*, *Minerva*, *Pellicano*, *Persefone*, *Pomona*, *Procellaria*, *Scimitarra*, *Sfinge*, *Sibilla*, *Urania* and *Vespa*.

TECHNICAL SPECIFICATIONS

DETECTING THE ENEMY

BRITISH

Passive hydrophones on each side of the bow provided warning of targets by picking up low-frequency sounds. In addition, Type 129 ASDIC (named after the Allied Submarine Detection Investigation Committee), which worked 'by sending out supersonic waves and measuring the echo, the presence, proximity, course and speed

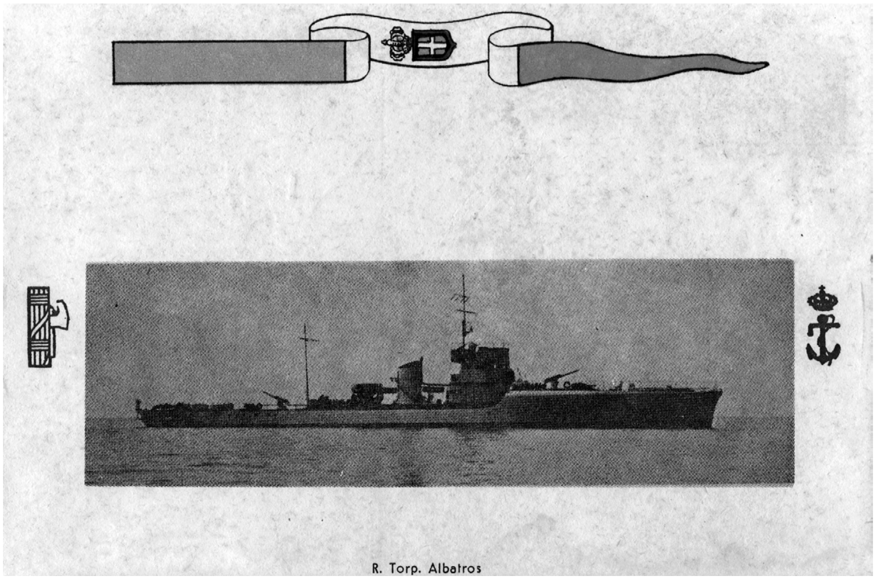


British submarines also used radar to detect targets. Here, a T-class boat, fitted with Type 291W radar and 20mm bandstand, surfaces. The radar comprised a 7.9×9.8in receiving monitor that had a base line moving along it. When the radar beam reflected a signal off an object, the line would blip. The Type 291W radar shown here – four dipoles mounted on an X-shaped frame fitted at the after end of the bridge in place of the W/T mast – was used to detect aircraft and ASW forces before surfacing at night, and was particularly useful on the surface at night to allow the captain to position the submarine submerged ahead of the target as the sun rose behind. (Cody Images) of underwater craft' (Mars 2008: 15), was used on all submarines for echo-ranging, sonic listening between 0.5kHz and 4.5kHz, and underwater communications (SST) at 10kHz. Transmitting a signal could give the submarine's presence away, however, and ASDIC was normally only used passively.

ITALIAN

Available since World War I, hydrophones gave a range and bearing to where noises originated from, accurate to ±5 degrees. The C-tube hydrophone (aka 'Broca') was improved in the 1920s, but by 1929 Italy relied upon foreign imports, notably the Multispot from Signal-Gesellschaft of Bremen and the Fonoscopio by ELAC of Kiel. The Multispot had 12 receivers in four groups of three with two groups on each side; on submarines the performance was good: up to 10,000m (10,935yd) with errors of ±3 degrees. The Fonoscopio had a range of up to 20,000m (21,870yd) with an error margin of ±2 degrees, and was both easy to use and reliable. The hydrophone proved useless on operations, however, for in order to use it ships had to stay still or move at no more than 4kn; even then, wind and sea noise interfered with performance and the listener had to stay silent. Because hydrophones and ECG could not work close to the ship, optical methods of detection were developed. A tube 49–52.5ft long with a glass bottom to observe submarines in clear seas was experimented with, as was putting a glass panel onto the side of the ship by adapting the C-tube hydrophone.

Although the Italians had obtained sonar from the British in the 1920s, initial experiments were not followed up and by late 1941, when the Germans gave sonar capability to the Italians, there would be few who knew how to work it. In 1938 the Italian SAFAR company started to build ECG sets, but were not given earlier test results and so had to start from scratch. In August 1941, Supermarina ordered an increase in ECG production; Italian industry would produce just six ECG sets per month from October 1942 when the SAFAR MC 3000 and GC 3000 were available, however, and in the interim Germany agreed to supply 25 sets to the Italians with a



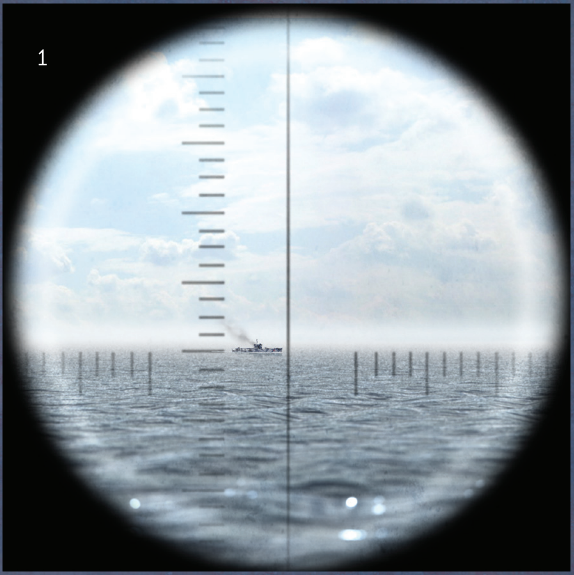
During 1931–34, the 500-ton *Albatros*, built in Palermo as a submarine chaser (*cacciasommergibili*), was used by Mariperman (Commissione Permanente per gli Esperimenti del Materiale da Guerra), the Regia Marina's naval experimental unit, based at La Spezia. In June 1939, SAFAR 600 was tested successfully on *Albatros*; however, production was suspended to create a submarine ECG. Discussions with the Germans were cut short by the outbreak of war; in the meantime, *Albatros* tested ECG with good results, achieving identifications at 3,000–3,500m (3,280–3,825yd) and sometimes at 7,000m (7,655yd) in early 1940. The maximum speed of the ship for these results was restricted to 12kn. Transfer of *Albatros* to the Strait of Messina, where currents hampered acoustic search, ended these tests. The ship's captain wrote to the naval commander of Sicily about his hydrophones: Fonoscopio was useless; the towed hydrophone was mediocre, but was being modified and was not available; and C-tube hydrophone results were 'more or less nil' because the machinery was susceptible to motion interference even when the ship was still. ECG was considered best – but SAFAR engineers had removed a part for modification, leaving it unusable. The captain stated that he wanted an 'ECG to be sent immediately and fitted on board, even though studies are being carried out' (quoted in Rauber 1978: 63). (Author's collection)

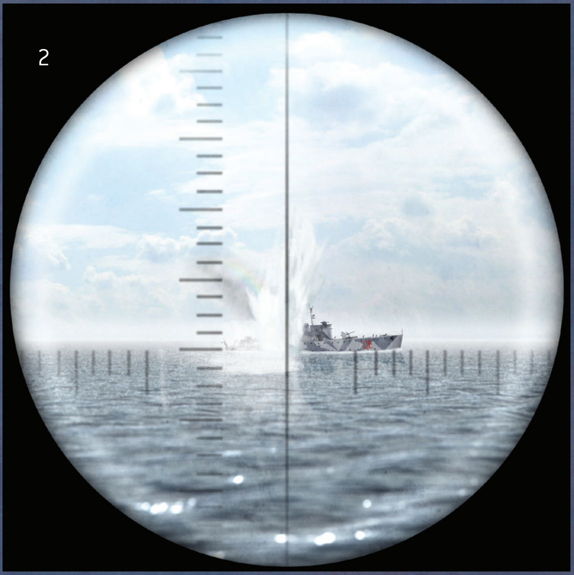
Italian sailors with binoculars stand on lookout on board an unidentified ship. In October 1941, Kapitän zur See Werner Fürbringer, at a meeting with Ammiraglio di Divisione Alberto Da Zara, stressed the importance of fast data transmission from the cabin operator to the bridge. Telephones and messengers were relied upon but were inefficient as data was often repeated, especially during the final attack phase. The German ASW inspectorate wanted to incorporate a receiver on the bridge to enable the captain to observe the track of the submarine. Italian delegates thought this unachievable in the short term and radio was seen as a temporary substitute. Fürbringer also reported the use of a circular perforated environmental metal cover on underwater receivers that better transmitted acoustic energy and allowed the ship to move at 17kn instead of 12kn while operating ECG, and 7kn instead of 4kn to operate hydrophones. The Italians requested the drawings of these devices. Because ECG was expensive and few sets would be given, the Germans suggested to the Italians that they fit ECG to ships that escorted convoys to Libya in all weathers, rather than to auxiliaries that hunted for submarines outside ports. Ships should be removed from escort work even if this temporarily put convoys at greater risk. The Italians agreed in part, but stated that their shipyards would not be able to keep up with demand. Italian industry would be able to produce six sets per month from October 1942. (Author's collection)

minimum range of 500m (545yd) – 17 sets were immediately available and another eight would follow by the end of November 1941. At the end of 1941 ECG was fitted on *Orsa*, *Castore*, *Sagittario* and *Lince*, all of which happened to be in port in maintenance; by March 1942, only seven ships had sonar, but by mid-June, 12 destroyers, 18 torpedo boats and 16 submarine chasers had received sets (the Royal Navy had 2,000 sets). Further developments, including a gyrocompass to register distance from the submarine and an automated indicator to start depth-charging, were too late to be fitted before the Armistice.

On 11 December 1941, *Lince* departed on operations to protect a naval force departing Taranto with German personnel to supervise the ECG and newly installed German depth charges. A submarine happened to be present and so training was carried out. Initially, the gyrocompass did not give proper readings and affected ECG performance. Speed was restricted to 12kn (later increased to 16kn) during use. Operators used a table showing how far a submarine travelled at certain speeds to help read the echoes. In one two-month period *Lince* and *Sagittario* carried out 40 24-hour search missions. Ten missions were conducted on the day before the arrival or departure of a convoy, with some on established routes three hours before a convoy was due; the others were random searches over an area of 1,000 square miles.

In action, ECG was only as good as its operator. On 29 January 1942, in bad weather, *Sagittario* was sighted by *Proteus*, which fired two stern-mounted torpedoes, both of which missed. *Sagittario*'s captain reported how the ECG 'did not give even a slight indication of a submarine's presence, despite sailing at 13 knots. This is attributable, in my opinion and past experience, to the operator's lack of experience, who was not able to carry out such a delicate task' (quoted in Rauber 1978: 207). Rauber stressed the 'incredible uncertainty in identifying the echoes which the apparatus gave', how 'it was often the case that only one person could carry out his job properly' and how 'some operators did not understand their officers because of a lack of education' (Rauber 1978: 207). *Sagittario* collided with *Proteus*; both managed to return to base.





PERISCOPES IN COMBAT

These periscope views show two moments in the encounter between *Unshaken* and *Climene* on 28 April 1943. A submarine's search periscope (**1**), which was 9in in diameter tapering to 3.5in, was used to search for surface ships – particularly prior to surfacing – and could be switched between high and low magnification and also elevated to search for aircraft. Low power (1.5×) gave a field of view of 40 degrees and was used for a brief all-round view, while high power (6×) had a field of view of 10 degrees. While ships could initially be spotted this way, the attack periscope (**2**), 7in in diameter tapering to 1.5in for the upper 5ft to minimize water disturbance, was used to target ships as the decreased water disturbance made the submarine harder to spot. Because periscopes could be seen, the ideal range for a torpedo attack was above 1,000yd. Blamey described their use during an attack; because the purpose was to put the submarine 'in the correct position for a successful attack without being detected', the captain 'only allowed enough of the periscope to break surface to allow him to acquire all necessary target information, such as masthead height, target course and speed, and the type of vessel, in order to set the correct running depth on his torpedoes, the position and number of escorts etc.' (Blamey 2002: 79). Lieutenant E. Woodward on *Unbeaten* described a failed approach on 14 May 1941 in which he missed his chance: 'speed was restricted, as I did not want him to see my periscope wash. I was only able to get within 4,500 yards' (quoted in Wingate 1991: 59–60). Sometimes a wide sweep or a complete circle was necessary.

Once a target was spotted its course, speed and estimated range were inputted into the 'fruit machine'; when the captain returned to periscope depth he knew where to train the periscope because the fruit machine calculated the enemy's new position from the information. If the enemy had adopted a zigzag course in the interim the new course details were inputted into the machine. Also 'the submarine's own course and speed must be set on the dials of the machine. All the time two pointers on its face are clicking round. One represents the submarine, the other the enemy' (Anscomb 1957: 65). When the pointers were in line the captain gave the order to fire the torpedoes, which should then run on a converging course with the target. The captain would attempt to be abeam the target to mitigate wrongly estimating the target's speed. A salvo was spread by leaving a firing interval, which resulted 'in a time spread rather than angle spread', and in this way 'torpedoes would be fired ahead of the target, at the target and astern of the target' (Mars 1971: 105). Alternatively, by firing with the rudder the concentration of a salvo could be accentuated. If the submarine was swinging towards the direction of the target, the torpedoes would be concentrated; if swinging away this would be reversed. Mars thought that 'four torpedoes should always be fired at a sizeable target' (Mars 1971: 149).

MOBILITY

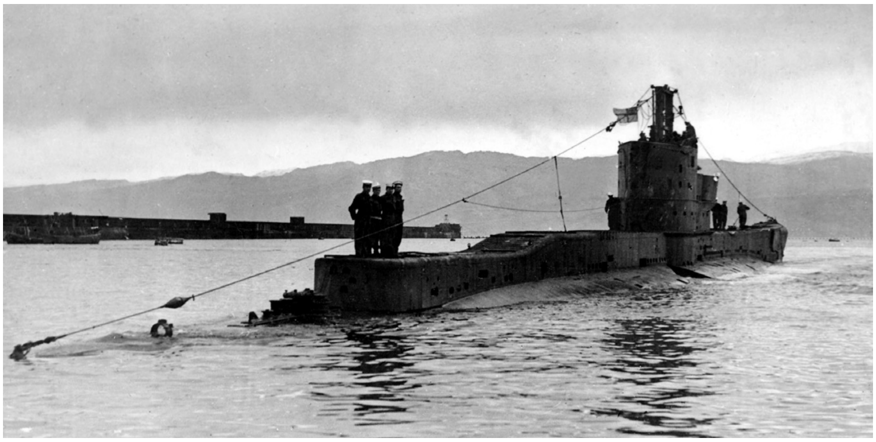
BRITISH

Submarines had diesel engines for use on the surface and electric motors for use when submerged, but only on the surface could the electric batteries be recharged and cylinders refilled with compressed air to enable the ballast tanks to be blown.

The T-class boats' handling on the surface in good weather was described by Commander R. Raikes, commander of *Tribune* and *Tuna*, as 'perfect. Both ahead and astern they answered the helm quickly, they were remarkably manoeuvrable although they rolled like awful cows … *Tribune* was a joy to handle. They were very uncomfortable diving in heavy weather until you got down, then they were steady as a rock. *Talisman* was a dream to trim…you could catch a stopped trim quite easily' (quoted in Kemp 1990: 22). Two auxiliary tanks were used to adjust trim while diving, and five others were used to compensate for changes in the submarine's weight. The depth limit was 300ft for a riveted boat, but many went to greater depths. If the telemotor operated from the control room failed, the hydroplanes could be operated manually; however, if they broke down in the vertical position, making headway was not achievable.

On the U-class boats, six internal ballast tanks were fitted for diving and were hydraulically operated from the diving panel in the control room. There was also a quick-diving tank. The forward pair of hydraulically operated hydroplanes was above the waterline when on the surface and could be folded flat against the side of the casing to prevent damage in rough weather; the after pair was below the surface either side of the rudder.

Maintaining trim (or buoyancy) required concentration, and the first lieutenant would use compensating tanks to alter the submarine's weight to attempt to achieve the required depth. Once the boat surfaced, the low-pressure blower would empty the main ballast tanks of all water; in fine weather, however, the tanks remained partially flooded to assist diving. Mars described how trimming in this manner allowed 'us to settle in the water, reducing our silhouette and also kept us ready for a quick dive' (Mars 2008: 26), but to do so was not straightforward – the weight of the submarine varied according to the amount of provisions consumed or the number of torpedoes fired, and if the submarine was moving, its speed and the angle at which it moved through the water



Here is *Parthian*, Charles Anscomb's submarine in 1940–41, one of the few older submarines to survive the 1940 fighting – but only just. When detected, a submarine would attempt to dive. On average, O-, P- and R-class boats managed to do so in 40 seconds, the S class in 30 seconds, and the U class in 20 seconds. If the submarine was already trimmed these times were reduced. Diving time for T-class submarines was about 30 seconds from a 50 per cent buoyancy condition. On all submarine types during diving, the officer of the watch shut the upper hatch and descended the conning-tower ladders into the control room. There the duty watch keeper opened the main vents on the ballast tanks by pulling levers, while the hydrophone operators turned their wheels to dive. The hatch that closed the conning tower off from the pressure hull was shut. On rising, at 40ft the lower hatch was opened, then the upper hatch likewise, and the stale compressed air rushed out. In August 1940 in the Adriatic, *Parthian* fired six torpedoes at a Zara-class cruiser from 350yd, but 'the water which should have flowed into the tubes in their place did not have time to do so. The submarine became too light for'ard and started careering wildly to the surface' and air that 'normally vented inside the boat, would be rising to the surface to give away our position' (Anscomb 1957: 73). The foreplanes were put hard to dive; the compensating and quick-diving tanks were flooded and speed increased to full ahead to gain traction. Two torpedoes struck home, but another cruiser 'missed us by inches, and the rumble of her propellers sounded like an express train passing over a bridge. This was followed by a shuddering explosion as she started to depth-charge us' (Anscomb 1957: 73). (Cody Images)

British submarine classes: mobility specifications			
Class	**Engines/motors**	**Speed (surface/ submerged)**	**Range (surfaced)**
O class Group II	4,600bhp/350bhp	17.5kn/9kn	8,400 miles at 10kn
P class	4,640bhp/1,635bhp	17.5kn/8.6kn	8,400 miles at 10kn
R class	4,640bhp/1,635bhp	17.5kn/8.6kn	8,800 miles at 10kn
River class	10,000bhp/2,500bhp	22kn/10kn	10,000 miles at 8kn
Grampus class	3,300bhp/1,630bhp	15.5kn/8.75kn	5,880 miles at 9.3kn
S class Group III (1939)	1,900bhp/1,300bhp	14.5kn/9kn	5,210 miles at 10kn
S class Group III (other)	1,900bhp/1,300bhp	14.5kn/9kn	5,210 miles at 10kn
T class Group I (*Torbay* and *Trident*)	2,500bhp/1,450bhp	15.25kn/9kn	9,550 miles at 10kn
T class Group I (other)	2,500bhp/1,450bhp	15.25kn/9kn	6,945 miles at 10kn
T class Group II	2,500bhp/1,450bhp	15.25kn/8.75kn	6,945 miles at 10kn
T class Group III	2,500bhp/1,450bhp	15.25kn/8.75kn	9,550 miles at 10kn
U class Group I	615bhp/825bhp	11.25kn/9kn	3,300 miles at 10kn
U class Group II (1939)	615bhp/825bhp	11.25kn/9kn	3,300 miles at 10kn
U class Group II (1940–41)	615bhp/825bhp	11.25kn/9kn	3,300 miles at 10kn

affected trim. Speeding up gave more effect to the hydroplanes (for diving on the U class, speed had to be at least 7kn) and prevented wallowing; if the submarine was too slow, however, it became heavy and could go below periscope depth.

ITALIAN

The speed at which an escort could close with its target after detection greatly influenced its chances of a successful attack. Anscomb, hauled on board *Circe* (a Spica-class vessel) after *Tempest* was forced to the surface, was impressed by *Circe* pushing her stern down, 'her bow wave and boiling wake something to gape at … Every now and then a big wave hit her and she bucked and shied like a nervous little mare being put to the sticks for the first time' (Anscomb 1957: 130). During trials, 19,000hp engines produced 34kn, but during wartime, with increased fuel load and more

Italian torpedo-boat classes: mobility specifications			
Class	**Engines/motors**	**Speed**	**Range**
Rosolino Pilo class	14,800 or 16,000bhp	29 or 30kn	1,200 miles at 14kn
Giuseppe Sirtori class	15,500bhp	30kn	2,000 miles at 14kn
Giuseppe La Masa class	15,500bhp	30kn	2,230 miles at 12.5kn
Generali class	15,500bhp	30kn	2,000 miles at 14kn
Palestro class	18,000bhp	32kn	1,970 miles at 14kn
Curtatone class	22,000bhp	32kn	1,800 miles at 15kn
Albatros	4,300bhp	24.5kn	1,420 miles at 14kn
Spica class Climene group I	19,000bhp	34kn	1,900–1,960 miles at 15kn
Spica class Climene group II	19,000bhp	34kn	1,900–1,960 miles at 15kn
Spica class Perseo group I	19,000bhp	34kn	1,900–1,960 miles at 15kn
Spica class Perseo group II	19,000bhp	34kn	1,900–1,960 miles at 15kn
Spica class Alcione group	19,000bhp	34kn	1,900–1,960 miles at 15kn
Ariete class	22,000bhp	31.5kn	1,500 miles at 16kn
Orsa class	16,000bhp	28kn	5,100 miles at 14kn
Ciclone class	16,000bhp	26kn	4,000 miles at 14kn
Gabbiano class	3,500/300bhp	18kn/6kn	3,000 miles at 15kn/16 miles at 6kn

weapons (by 1942 the ships displaced roughly 1,200 tons each), only 29kn. During head-on seas, vibrations occurred and steering was difficult, creating yaw. On *Orsa*, turbines generated 16,000hp and speeds of 25–26kn on operations, which was similar for *Ciclone*. On both a longer deckhouse improved seaworthiness.

Gabbiano-class vessels had Fiat M 407 seven-cylinder diesel engines that gave 1,750hp for a speed of 19.8kn. Electric motors, specifically installed to give these vessels the performance required to hunt submarines, each gave 75hp and, with 60 batteries, speeds of 7kn for six hours. The electric motors were coupled up to the main drive shafts after the diesel engines were uncoupled. Lieutenant J.H. Bromage, captain of *Sahib*, recalled his battle with *Gabbiano* and *Euterpe* on 16 April 1943:

> The Italians at this time had coastal escorts which had a form of submarine propulsion: they hunted on electric motors operating off batteries but changed over to diesels when they went into attack. At the time I was unaware that such vessels existed. For some three-quarters of an hour I was well aware that I was being hunted because asdic transmissions in contact could be heard. Nevertheless I was mystified because I could not hear any hydrophone effect from the engines of the attacking craft. (Quoted in Evans 2010: 353)

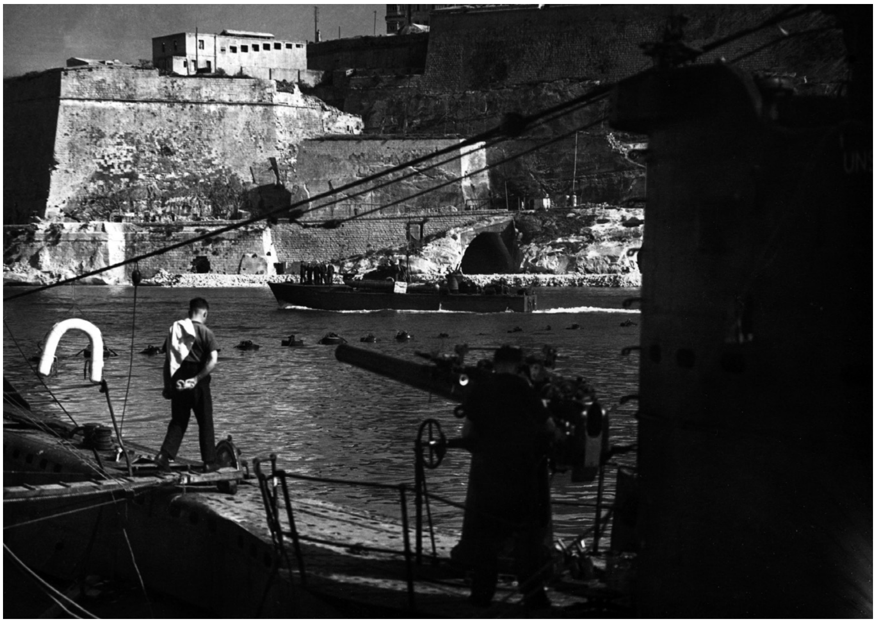
The Germans stressed the importance of closing quickly with a submarine. Speed was more important than using hydrophones, which they thought should only be used on smaller ships and were an auxiliary tool that complemented sonar; more depth charges were needed and bow-mounted guns should be replaced with more depth-charge throwers. Here, German advisors are shown on board an Italian escort. The Germans were well aware of the importance of the convoy battle. On 9 September 1941, with the Deutsches Afrikakorps on the Egyptian border, Vizeadmiral Eberhard Weichold, head of the German naval staff in Rome, summed up the threat to Axis shipping for his colleagues in Berlin: 'Now, as formerly, the most dangerous British weapon … is the submarine … In spite of improved harbour defence, submarines lurking in or just outside the harbours have sunk or damaged eight ships … A very severe supply crisis must occur relatively soon. This is because Italian freight space which is sunk cannot be adequately replaced' (quoted in Wingate 1991: 105). On 13 September, the German High Command also highlighted a worsening situation: 'Enemy submarines definitely have the upper hand. German and Italian naval and air forces for patrol and escort duties and for planned anti-submarine measures are inadequate both in numbers and equipment … There are constant losses. The numbers of British submarines must be expected to increase' (quoted in Wingate 1991: 105). Großadmiral Erich Raeder, head of the Kriegsmarine (German Navy), realized the implications of the losses and stated that it was necessary to arrange for the immediate 'transfer of anti-submarine vessels and motor minesweepers' and 'the return of German air forces to Sicily. The escort of German and Italian transports to North Africa is a most vital task which must take priority over everything else' (quoted in Wingate 1991: 105). (Cody Images)

ARMAMENT

BRITISH

Discharging a torpedo, fired by an impulse of air, produced 'a slight backward lurch, as though the boat had momentarily bumped into something large and soft' (Young 2004: 38–39), and the loss of weight forced the submarine up. To mitigate this, torpedo tubes were flooded before firing, using water carried inside the submarine – the difference between the displacement of the torpedo and the capacity of the tube – in order not to alter the trim by using water from outside the submarine. When the torpedo was fired, water ballast was moved within the boat to compensate for the weight lost. The outside tube door was then shut and water drained away from the tube into the torpedo overflow tanks before the inside door was opened and the tube reloaded. The moment a torpedo was fired, the automatic inboard vent valve returned the air into a tank to prevent air following the torpedo out and revealing the presence of the submarine.

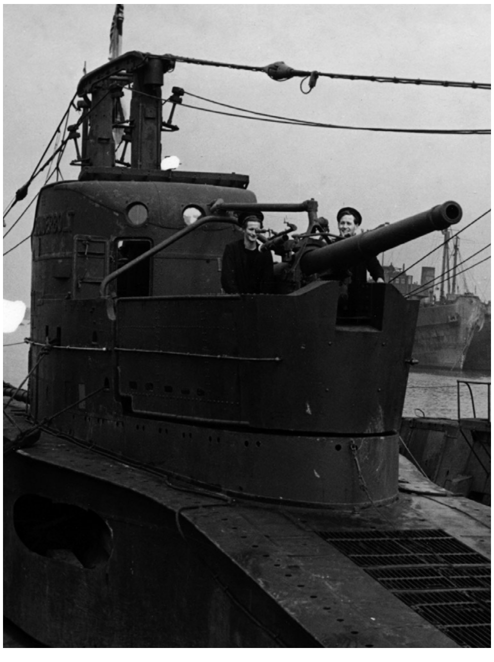
Sometimes torpedoes refused to function. In a mid-February 1941 action, *Unique* fired four: three hit the seabed and the fourth suffered gyro failure and turned back towards the submarine, careering over the after-casing. In two weeks, five targets were attacked by U-class boats with 16 torpedoes – none found their mark; this was explained by poor estimations of speed and course and torpedo failures and malfunctions. On 19 May 1941, *Unbeaten* fired three torpedoes at a merchant ship: two malfunctioned, exploding on the seabed and throwing the submarine's stern up to the surface. After diving 140ft to the seabed, *Unbeaten* endured 30 depth charges in 45 minutes and could only move off safely eight hours later. On 27 August 1941, *Urge* fired a salvo at a tanker: one torpedo hit the ship, but three others misfired, one



All submarines had a gun deck as well as their torpedo armament. Here, the 12-pdr gun on a U-class boat at Malta is shown. During a night alarm in the Strait of Gibraltar in April 1942, Mars, aboard *Unbroken*, described how the gun crew 'climbed over to the gun platform. Smoothly, quickly, silently, they unlocked the gun and unclipped the watertight ready-use lockers with their ten rounds of ammunition. Haddow, the armament officer, who would direct the fire of the gun, had already joined me on the bridge … The ammunition party joined up to form a human chain from the magazine to the gun' (Mars 2008: 26). (Cody Images)

sticking in the tube and forcing the submarine to surface with smoke pouring out. Fortunately, the stuck torpedo fell out and the submarine dived before Italian escorts could react. On *Porpoise*, Blamey reported how adjustments to the torpedo shutters were needed 'to ensure that the torpedoes did not foul when they were fired' (Blamey 2002: 22).

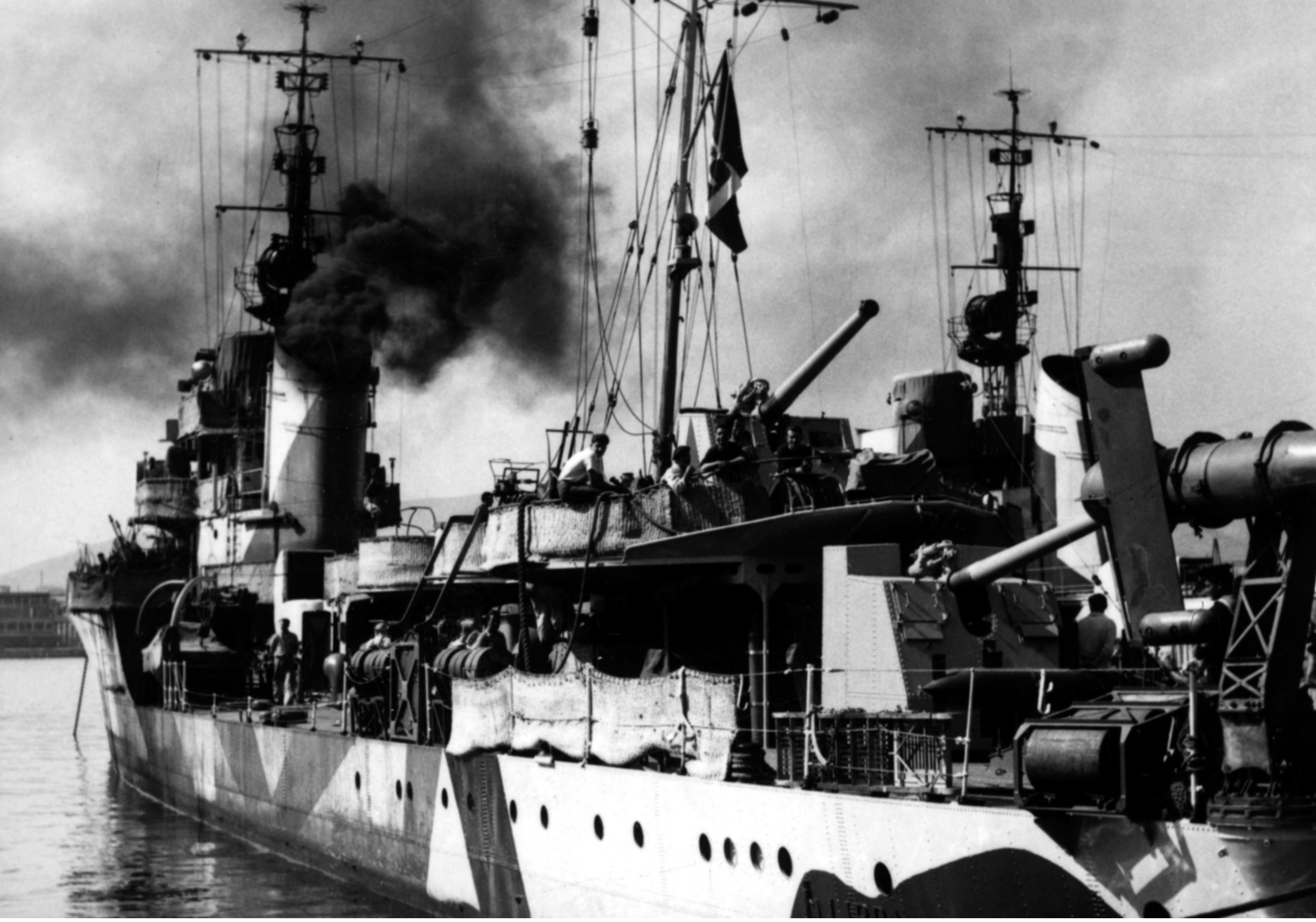
On 19 January 1943, Mars fired four torpedoes at the troopship *Edda* which was escorted by two torpedo boats off Ras Turgeuness. The first torpedo hit, but the second ran in circles and passed over the control room before plummeting to the bottom – only the second defective out of 40 torpedoes he fired. On another occasion, Mars fired at 5,000yd near the coast, grateful that the muddy water would conceal the torpedoes' tracks, but two stuck in the mud and failed to explode. He tried again at 4,000yd, but the coastal current steered the torpedo away from the target.



On T-class submarines such as *Thunderbolt* (shown here), a 4in Mk XXII gun, accessed through a gun-tower hatch, was mounted forward of the conning tower behind a waist-high wall. There was a crew of five: gunlayer, breechworker, sightsetter, trainer and loader. Lockers on the superstructure held five rounds each. Additional rounds were carried up a human chain from the magazine beneath the wardroom and reached via a hatch in the passageway. Armament on the T-class boats also included ten torpedo tubes. A bulbous bow contained two external tubes and the casing sloped down to the conning tower, where it rose again to accommodate two external torpedoes amidships. External tubes were vulnerable to damage, however. Also, they were unreliable and could not be serviced while at sea. Each internal tube was fitted with a hydraulically operated bow cap, worked by the telemotor. Reloading was simplified: transporter trolleys with insecure strops were replaced with brackets with hinged arms. (Cody Images)

ITALIAN

Until 1938, no priority was given to underwater weapons – except torpedoes. Personnel were not assigned as specialists, and



study and development was lacking. Department T of the Comitato Progetti Armi (Weapons Projects Committee) should have led, but did not. Private companies were used instead, with small offices, few technicians and contracts renewed every month. There was a lack of funds and World War I equipment was retained. Mines were relied upon, with 25 per cent being used against submarines. On torpedo boats, few crewmen were trained to use all the weapons on board. For guns, older torpedo boats relied on World War I-vintage 4in models, but the firm Odero-Terni-Orlando developed the 100mm/47 Mod. 31 and Mod. 37, based on the Austrian 10cm Skoda K10 naval gun, for the Spica, Orsa, Ariete and Climene classes. The Breda 20mm/65 Mod. 1935 was the standard anti-aircraft weapon that replaced the Breda 13.2mm Mod. 1931 and was mounted commonly as a twin weapon on a vertical disc inside a circular rim. It was gas operated and could elevate to 90 degrees. Alternatively, the Scotti Issota-Fraschini-20/70 Mod. 1939 was available.

The BTG (*bomba torpedini da getto*) depth charge, which used a hydrostatic fuse set at a predetermined depth – up to 100m (328ft) – was the main Italian ASW weapon, and there were many types. After World War I, 110lb and 220lb depth charges were used; the smaller bomb had a lethal radius of 33ft and a damage radius of 82ft. In 1936 the firing mechanism was modified to operate at different depths. By 1942, the BGS (*bomba da getto a scoppio simultaneo*), a 110lb depth charge, was being used on the *scaricabombe Gatteschi* (a multiple-launch rack system) on the Gabbiano-class corvette. The Gatteschi system discharged several depth charges that could be set

Here, on the Spica-class vessel *Libra*, two OTO 100mm/47 Mod. 37 guns plus rails and throwers for depth charges are evident on the stern. *Libra* was commissioned in 1938 and was the last Spica-class vessel to be decommissioned, in 1964. In 1941, *Libra* served as part of 8a Squadriglia Cacciatorpediniere. By August 1942, escorts were going to sea unprepared for 24-day missions every month: *Sagittario* on 19 August without working sonar, radio or radio-telephone; *Lince* without enough depth charges. (Cody Images)

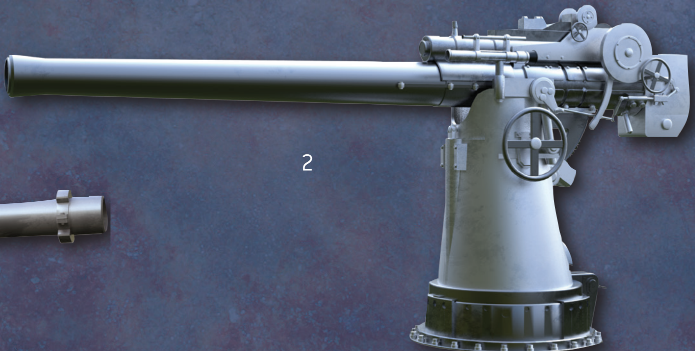
BRITISH SUBMARINE WEAPONRY (NOT TO SCALE)

The 21in Mk VIII torpedo (**1**), which entered service in 1927, was 21.6ft long and had 750lb of TNT (the early and late Mk VIII** were improvements with 721lb and 805lb of torpex, respectively); the Mk VIII and early Mk VIII** had a range of 5,000yd at 45.6kn and 40kn, respectively, and the late Mk VIII** 7,000yd at 41kn. A contact pistol detonated the warhead when the torpedo struck the target. A non-contact compensated coil rod (CCR) magnetic pistol was developed to detonate the warhead underneath a target, but often these detonated early.

There was a severe torpedo shortage, and so some old Mk IV warheads were fitted to Mk VIII bodies. The Mk IV warhead was slightly heavier than that designed for the Mk VIII, however, and proved to be too long to fit into the stowage racks, with the result that Lieutenant G.R. Colvin, commander of the S-class Group II submarine *Sealion*, decided to fire them off rather than risk the chance of a misfire. The Mk VIII*E torpedo was developed for use in external tubes and had smaller propellers and a reduced speed.

The older O-, P- and River-class submarines had a 4in Mk XII deck gun, while the R-class boats had a 4.7in Mk IX gun. On *Porpoise*, it took 25 seconds from hatches open to gun firing, but the gun had a habit of 'failing to recoil after firing, and sitting back on its haunches like a stubborn mule refusing to budge' because 'the air/oil recoil system would lose its pressure after firing' (Blamey 2002: 150); Blamey would then get blocks and tackle and haul the offending barrel back into position. A piston-and-cylinder arrangement was supposed to restore the gun to its firing position ready, but required an air pressure of 350lb/in²; the cylinder was unable to hold this pressure and the gun refused to run out. The best position from which to fire was 1,000–2,000yd aft of the target's beam. The gunlayer and trainer would inspect the target through the periscope. After the surface order was given, the tanks were blown and the boat rose to 30ft, held down by the hydroplanes. When the positive buoyancy was too much, the hydroplanes were put to 'hard-a-rise'. The gunlayer removed the last clip from the hatch and the crew rushed out, propelled forward by the higher air pressure within the boat. One round was fired every ten seconds. The gunnery officer on the bridge would observe the shot and pass corrections down to the crew.

The 3in 20cwt Mk I gun (**2**) was fitted to some S- and U-class boats to provide defence against aircraft, but was also used against land targets and small ships deemed to be not worth a torpedo. The gun fired a 17.5lb projectile up to 12,400yd and had a 40-degree elevation. The 4in Mk XXII gun (**3**) mounted on some S- and all T-class submarines had a barrel length of 160in and threw a round weighing 31lb up to 10,000yd at 1,873ft/sec.



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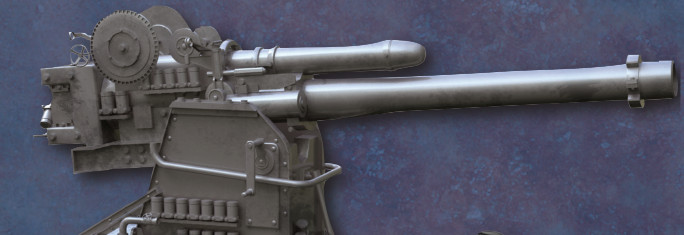
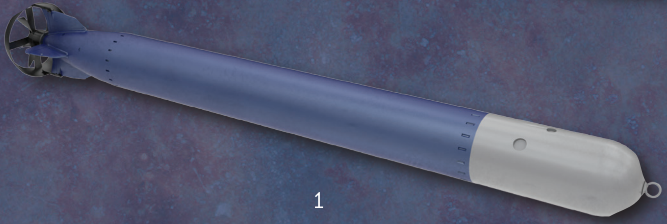


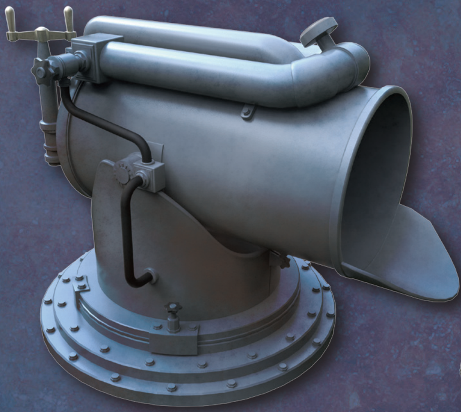


1

ITALIAN TORPEDO-BOAT WEAPONRY (NOT TO SCALE)

The Lanciabombe AS 432/302 Mod. 1934-37 (**1**) and Lanciabombe AS 302/1933 Mod. 1937 single-barrelled depth-charge throwers, with a scooped baffle at the front, were developed in the 1930s. The AS 432/302 was able to fire smaller types of depth charges with a tube inserted into the barrel. Range depended on the chamber pressure, but the AS 432/302 could achieve 120yd at 925lb/in^2. The thrower proved hard to reload and in mid-1942 was replaced with German throwers that could be reloaded faster. Eventually, with German depth charges and depth-charge throwers, the Italians could launch three bombs each at three different depths – 15, 45 and 70m (49, 148 and 230ft) – with each thrower.

The BTG (*bomba torpedine da getto*) 50/1917 (**2**) had 110lb of TNT and a hydrostatic fuse and was still in widespread use in 1940. The designations referred to the size of charge (in kilogrammes) and year of manufacture. The BTG 100/1927 model had 220lb of TNT and a depth-actuated fuse that could be adjusted to explode at 25, 50, 75 or 100m (82, 164, 246 or 328ft). Further types of depth charge were developed, including the BTG 50/1917, BTG 50/1927, BTG 100/1927, BTG 50/1936, BTG 100/1936, BTG 150/1940, BTG 30/1941, BTG 60/1943 and BTG 125/1943. The pistol used a hydrostatic plate to transmit pressure gradually with a spring compressing the charge. According to an Italian manual, the striker was 'released at the required depth [set by a ball and groove device], due to the action of the counter spring on the hydrostatic plate, to hit the percussion cap causing detonation' (quoted in Henry 2005: 116). Rauber states that in the period June 1940–December 1941, 4,833 depth charges were used by Italian ships. In total, 160 torpedo boats and destroyers carried out 556 practice attacks where depth charges were not used and 230 attacks where they were. There is no data for 1942, but in January–April 1943 Italian surface ships used 3,313 depth charges. Rauber states that in total, 20,000 depth charges were used by surface forces, with on average every action involving 25 being used. A carpet of 15 depth charges, with three lines and a distance of 50m (164ft) between each line, covered an area of 24,000 square yards. Sometimes depth charges malfunctioned. Mars told how what saved the submarine was 'the choice of a depth at which the enemy's charges did not explode. One of these actually landed on the fore casing, only to roll off and explode beneath us' (Mars 1971: 165). A flooding device was developed that made the depth charge inoperable if it failed to explode. The main gun on torpedo boats was the 100mm/47 OTO 1937 (**3**), which fired a shell weighing 29.1lb at a muzzle velocity of 2,805ft/sec. Ten shells could be fired per minute to a range of 16,840yd.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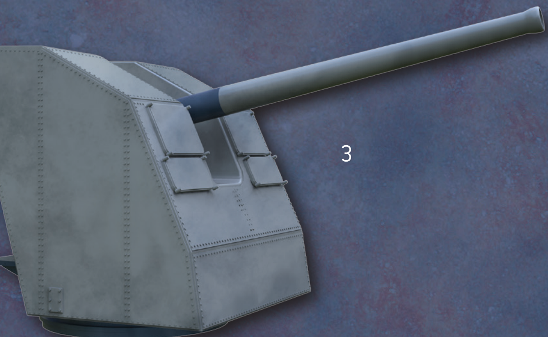
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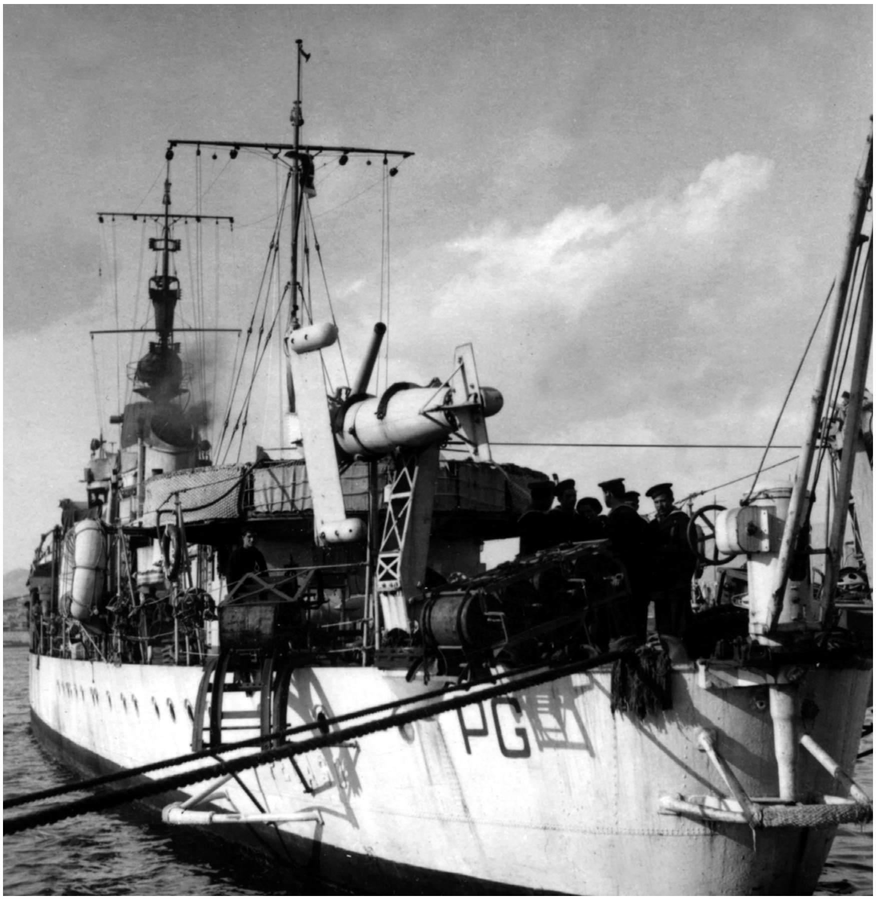


The torpedo boat *Pegaso* was scuttled at Majorca on 11 September 1943 to avoid capture by German troops. Fitted with six depth-charge throwers and four stern rails, the Orsa-class vessels had a heavier depth-charge armament than the Spica-class vessels. *Procione* also was scuttled, but *Orsa* and *Orione* served into the 1950s. Here on *Pegaso*, along with the depth-charge rails, there is a derrick in the middle of the stern to lower the Ginocchio towed torpedo and two minesweeping paravanes designed to cut wires attached to mines. Torpedoes of different weights that would be towed at depths of between 121 and 312ft were used on different ships, but were often lost when the cable broke or the brake did not work, and were difficult to recover. Overall, they were an 'inefficient arm which only caused problems' (Rauber 1978: 39). (Cody Images)

for variable speeds of descent, detonating at depths of 30, 60, 90 and 120m (98, 197, 295 and 394ft). Gabbiano-class vessels each had two Gatteschi systems, each with six rails of four bombs, and laid carpets overlaying each other. Eight bombs formed a pocket designed to explode at different depths. Crawford thought expending such a high number of depth charges in one area was wasteful, because rarely would the submarine be accurately located. Larger depth charges up to 1,100lb were tested, as well as depth charges that were placed on the seabed and set to explode after 30 days, but these were never used in action.

The German depth charges supplied to Italy were 'reliable and not difficult to use' (Rauber 1978: 176). The German WBD (Wasserbombe Type D) (397lb) and WBF (132lb) depth charges, manufactured by Krupp, had a robust timing mechanism and launcher. The German WB (called *bombe per lanci multipli* – 'bombs for multiple launches' – by the Italians) with a timed fuse could be launched in groups called *grappalo* that all exploded when one detonated. Six depth settings were used in increments of 15–25m (49–82ft) up to the highest setting. Blast radius was 26ft for the WBD and 18ft for the WBF. By late 1942 fewer German depth charges were being supplied, and the Italians built their own modified WB depth charges.

THE COMBATANTS

PERSONNEL

BRITISH

During World War I, experienced sailors volunteered for submarine service, but in the interwar years some men needed to be drafted from General Service. Those compelled to serve aboard submarines during peacetime did three years, while volunteers did five years and two years' General Service before they could volunteer for another five years. Admiral Sir Max Horton, appointed Flag Officer Submarines in January 1940, decided Hostilities Only recruits could serve after passing the Royal Navy's basic training course. Brian Broadley, the only one of his course who had volunteered for submarines, was surprised that within a week 'practically all my training class from *HMS Raleigh* were drafted' (quoted in MacKay 2009: 47). Some were unsuited, though Mars wrote 'only a tiny minority could not settle down' (Mars 1971: 48). According to Crawford, crew soon 'all knew what they were about', and there was a 'close community ... as long as both sides played the game … There was no room for keeping grudges'; despite the trying environment, he thought 'there was nothing special about maintaining discipline and morale as long as one kept everyone aware of what was going on and made everyone feel that they had an important role to play' (interview). Lieutenant Commander M.G. Rimmington, Anscomb's captain, was more authoritarian and believed he had 'the unalienable right to treat his men harshly at times', but 'felt it his duty to look after them and stand by them in any eventuality whatsoever' (Anscomb 1957: 83–84). When a rating's wife needed an operation he could not pay for, Rimmington deposited the money in the man's bank account.

According to Lieutenant B. Bryant, submarine service appealed to many because responsibility occurred at a younger age than in General Service, and submarine officers gained 'a reputation for being a bit of a law unto themselves' (quoted in MacKay 2009: 167). In 1938, after serving in battleships, Crawford 'wanted somewhere where I had more responsibility and close contact with the ratings' (letter to author). According to Captain G.W.G. Simpson, submarine captains 'possessed that ability to make instant decisions which reaps reward in submarine warfare' (Simpson 2010: 164) and Horton removed those aged over 35. Submarine captains were selected from first lieutenants. In 1919 a commanding officer identified some primary attributes for the role: 'Mental alertness to a high degree is necessary, also patience under trying conditions. Anything approaching nervousness is fatal to success' (quoted in MacKay 2009: 57). Mars thought command 'a heavy and frightening burden' with 'responsibilities out of all proportion to either age or rank' (Mars 1971: 66). In *Unbroken*, Mars' first lieutenant was a regular who had served in Mars' training submarine; the navigator was a reservist from the Merchant Navy, as was the engineering officer, who during a storm accused Mars of nearly breaking up the boat when running surfaced at high speed. Mars had him replaced as 'even the suggestion of bad feeling is fatal among a small group of men living in such proximity as we were' (Mars 2008: 51). Here is Commander J. Linton (aged 37) who won the Victoria Cross for sinking 30 ships totalling 100,000 tons. He spent 254 days at sea in a year and had 250 depth charges launched at him. *Turbulent*, with Linton in charge, failed to return from a patrol in March 1943. The last time Simpson spoke to him he was refusing a harbour break, preferring 'the hazards of constant patrol' (Simpson 2010: 268). (Cody Images)

Officers could attend the Royal Naval College at Dartmouth from age 14. Specialization occurred after promotion to sub-lieutenant and volunteers were admitted to submarine training after a commanding officer's recommendation. There were other paths to entry. At 13 George Hunt entered HMS *Conway* in 1930, as an officer cadet in the Royal Naval Reserve (RNR); along with HMS *Worcester* and Pangbourne Nautical College, the school prepared boys to be officers in the Merchant or Royal Navy. At 16 he joined the Merchant Navy and at 20, while serving on a merchant ship and also with the RNR, he passed his watch-keeping certificate at the Royal Technical College in Glasgow. In 1937 he had an interview to join the Royal Navy and volunteered for submarines. Early in 1940 the Admiralty allowed Royal Naval Volunteer Reserve (RNVR) officers to apply for submarine service (by 1945, 74 per cent of all wartime officers were RNVR). After basic training, Acting Sub-Lieutenant Edward Young RNVR had a day on a submarine and observed how 'The change from the noisy, turbulent surface world to this submarine peace amazed and delighted me' (Young 2004: 22). At the end of July 1940, he reported to submarine school at HMS *Dolphin* in Gosport for a shortened six-week course. In 1942 there were four RNVR first lieutenants serving there when Young arrived in the Mediterranean theatre.

ITALIAN

The Regia Marina expanded from 74,680 to 168,800 sailors at the outbreak of World War II, and to 259,100 by September 1943. In 1931, 20 per cent of Italian sailors were illiterate; the percentage was greater among recruits from southern Italy, the Regia Marina's primary recruiting ground. Some 53 per cent of ratings were volunteers serving a four-year term, while draftees served two years. Of Italy's 85,535 university students, only 13.56 per cent studied engineering. Those that were literate were sent into technical branches. There was a 'shortage of technical talent that placed severe limits on the extent to which the Italian armed forces could imagine, commission, operate and maintain complex machinery' (O'Hara, Dickson & Worth 2014: 129).

Nevertheless, sailors showed dedication to duty in trying situations, and at the end of World War II the Regia Marina, despite losses, remained intact with its morale unbroken. An unnamed stoker, serving on board the cruiser *Giovanni dalle Bande Nere* near Stromboli, described being torpedoed at 0900hrs on 1 April 1942 by *Urge* in the forward boiler area; he was in the aft boiler area and made it to the upper deck where he 'started looking for a life vest, but then I decided to jump without wearing one'; he was 'in the water for a long time until the destroyers in escort [*Aviere* and the torpedo boat *Libra*], after having thrown some depth charges against the submarine which had torpedoed us' picked him up. On *Aviere*, 'due to the intense cold, I went down to the boiler room and hugged a steam pipe' (quoted in www.regiamarina.net). He was sent to the coastal artillery at La Spezia, but 'tried several times to get back aboard a ship because, after all, life was better than on shore, but it did not work. The strange thing is that our pay was higher on shore: 180 lira on the "Bande Nere" and 200 lira in La Spezia' (quoted in www.regiamarina.net).

An unnamed stoker called up in early 1941, who served on board *Giovanni dalle Bande Nere*, thought the officers 'a separate caste by themselves, which refused to talk to a simple sailor unless to give orders' (quoted in www.regiamarina.net). Officers made up 5.4 per cent of total personnel (compared to 9.2 per cent in the Royal Navy) and there was a large social gap between officers, NCOs and enlisted men. Luigi De Angeli, a naval stoker aged 20 who was drafted on 10 July 1940, described 'an iron discipline and complete separation between officer, non-commissioned officers and sailors. Only in some cases, very rarely, one could establish a less rigid report structure between sailors and officer. The superior officers were from noble families, and some displayed scarce attitudes to collaboration and poor understanding towards the crews' (quoted in www.regiamarina.net).

An Italian officer, name unknown. Many, such as Capitano di Fregata Enea Picchio, had a strong sense of duty and were not put off by the deteriorating strategic situation. As a *primo tenente di vascello* in 1941, Picchio commanded the Spica-class *Andromeda* and escorted convoys from Brindisi to Durazzo; however, by July 1941, he wrote to his sister that he was 'slaving away in a shore job' and applied for a ship. At the start of 1942, promoted to *capitano di corvetta*, he commanded the old destroyer *Saetta*, and in August that year was decorated for towing the damaged merchant ship *Bixio* to safety after it was twice hit by a torpedo. He was then sent on leave, but wrote 'I have to get back to my proper life and am very fit' despite being 'near the end of my sea-time [22 months]' and that he did not 'want to upset the ship's company' (quoted in Cocchia 1958: 158). On 7 February 1943, *Saetta* was with a convoy when the Ciclone-class *Uragano* stumbled into a minefield. Picchio attempted a tow but also hit a mine; after ordering abandon ship, he remained with his sinking ship. Many officers with experience of submarines were sent to torpedo boats: Capitano di Fregata Carlo Fecia di Cossata, commanding the submarine *Tazzoli* and responsible for the sinking of 16 ships in the Atlantic, transferred to the Ciclone-class *Aliseo* in February 1943. On 9 September 1943, while off Bastia on *Ardito* – another Ciclone-class vessel – and having heard news of the Armistice, he sank German warships that departed next morning. In 1944 the new Italian government did not recognize the monarch, and Fecia refused to obey orders. Imprisoned and released at the behest of protests from the town's residents, he was dismissed from the service. (Author's collection)

TRAINING

BRITISH

By the 1920s the four-month submarine officer's training course, which previously relied on theory taught from textbooks, was more practical and allowed officers to apply knowledge rather than be 'swamped in a maze of complex detail' (MacKay 2009: 52). By 1939 a report emphasized that all watch-keeping officers were 'trained to sum up situations and act immediately' (quoted in MacKay 2009: 53). Understanding the workings of a submarine was more important at this stage than learning tactics, but Blamey complained that 'Relatively few officers appreciated the limitations of running machinery, or the need for careful and sympathetic attention' (Blamey 2002: 104).

Here, while on trials at Holy Loch in the summer of 1942, a practice torpedo is being loaded aboard the T-class boat *P 311*; *Sibyl* – an S-class Group III boat ordered in 1940 and commanded by Lieutenant E. Turner that had a stern torpedo and a 20mm anti-aircraft gun fitted as well as six bow tubes – is in the centre, with an unidentified submarine at right. In 1940–42, the 8th Submarine Flotilla at Gibraltar operated S-class submarines whose duties 'were mostly the final training and mechanical perfection of reinforcements for the 1st and 10th Flotillas. Patrols off south France were seldom fruitful but good training' (Simpson 2010: 245–46). During his initial patrol from Gibraltar, Mars gave his crew 'plenty of exercises … gun-drill, rehearsals in damage control, and change round positions in which everyone learned to do everyone else's job' (Mars 2008: 48). The intention was to inculcate a 'complete understanding down the line of communication to the most junior man' (Mars 1971: 108). On 5 December 1942, off Capri, *Sibyl* was depth-charged unsuccessfully by *Groppo* (Ciclone class) and *Orione* (Orsa class) after attacking a convoy. On 14 March 1943, off Sicily, *Persefone* and *Antilope* (both Gabbiano class) used 95 depth charges against *Sibyl*, also unsuccessfully. (© IWM TR 526)

In 1919, the Commanding Officers' Qualifying Course – named 'Perisher' because those who failed it were returned to General Service – was established. Training included attacks in various conditions; however, in the 1930s, Bryant noted that night attacks on the surface were not allowed because of the risk of collision. Theory was taught on the 'attack teacher', a building of two floors: the bottom floor had a revolving cylinder that represented the control room and here the trainee stood by a short periscope that pierced the attack table on the upper floor, where on a travelling platform 'model targets were placed in varying positions at different ranges' (Mars 1971: 105). Young described how the target moved on a small central turntable according to movements pre-arranged by Lieutenant Commander Woodward, the chief instructor; orders were given by the student and plotted by members of the Women's Royal Naval Service. Simple attacks, where the target maintained the same speed and course, developed into more complicated scenarios that included targets zigzagging. Every attack was carefully analysed afterwards.

The students would then go to the 7th Submarine Flotilla at Rothesay on the River Clyde where for three weeks up to ten submerged attacks were carried out each day during daylight. During a torpedo attack, a petty officer, standing behind the captain at the periscope, read off the bearing and range of the target, which were entered by an officer on the 'fruit machine' – an electrically driven, mechanical, fire control computer – and reset after each target observation. The result was the 'director angle', i.e. the aim-off to 'allow for the target's speed and the time the torpedoes would take to reach his track' (Young 2004: 38). A special trip to Scapa Flow to practise against battleships guarded by a destroyer screen followed. Throughout, as well as formulating firing solutions, the students 'were being closely watched for other necessary attributes such as judgment, determination, power of command, reaction to crisis and general grip of any situation' (Mars 1971: 108). When a torpedo was fired students were

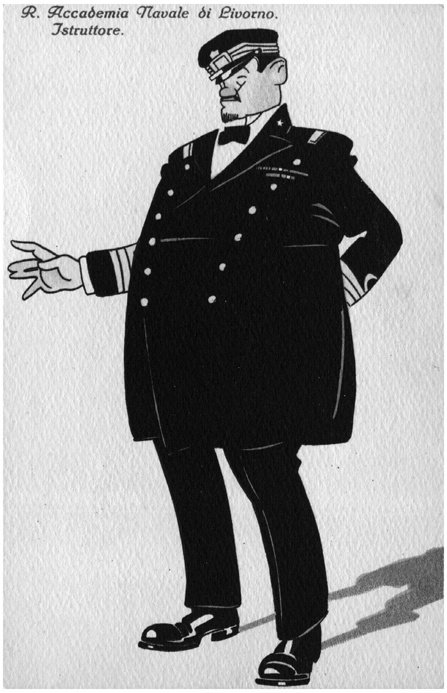
Here, an O-class boat – possibly *Otway* – is training at Holy Loch during 1942. According to Mars, standards were not that rigorous on the older boats in peacetime. Because of a lack of war experience, some captains 'tended wildly to underestimate the enemy's capabilities; whilst others were over cautious' (Mars 1971: 83). Even during wartime, submarine commanders 'were not given sufficient instruction in evasive tactics to counter heavy depth-charging' (Mars 1971: 106), which meant that they were not prepared for the worst. Basic submarine training for ratings was only three weeks, which meant that continuation training when assigned to a submarine was vital to produce competent submariners; training during wartime was limited, however, because of the rush to ready new boats. In mid-1940, Young discovered that 50 per cent of his crew on *H 28* were raw recruits and some had not gone to sea before. In December 1941, Anscomb also described 'very inexperienced young submariners' on *Tempest* who had to be taught how to operate the submarine in two intensive weeks before sea trials, during which they 'slogged through gunnery, torpedo and diving trials in the lochs' (Anscomb 1957: 108); then, hours before sailing on operations, the majority were removed and replaced by new recruits that had to be trained on the way to war. In mid-1940, on *Porpoise*, the majority of Blamey's crew departed to form the nucleus of crews for new submarines. Many engineers 'were replaced by those new to submarines. This was both worrying and frustrating' because 'a badly trained one could strip a gear wheel, bend a connecting rod, ruin an attack, or even send us to the bottom' (Blamey 2002: 121). On the way out the results of a practice dive 'were anything but reassuring' as 'the wrong valves were opened or shut in error' (Blamey 2002: 124). (© IWM TR 533)

taught 'It was essential to get away from the tell-tale spot where the torpedo tracks started' (Mars 2008: 68–69). An assignment with the 7th Submarine Flotilla usually followed, during which submarines were 'practice targets for destroyers and other escort craft'; training was 'inordinately dull', but 'sometimes we managed to get in a practice attack on the surface ships at the end of the day' (Young 2004: 43).

ITALIAN

Comando Navale (Naval Command) issued few formal training documents and only some departmental reports considered ASW training, with results rarely written up thoroughly. Only the Divisione Scuola Comando (Training Division Command) followed ASW closely and considered zigzagging to evade torpedoes and searching for submarines by identifying periscopes and torpedo wakes; the threat from torpedo-armed aircraft was more apparent, however, and in the 1930s torpedo boats practised avoiding them. There were a handful of exercises with depth charges after manoeuvres were finished. Training was modest because there were no sensors to ensure that it was carried out safely. In 1939 the training manual SM 10 S did include depth-charge exercises. A target barrel full of oil would be suspended at 50m (164ft) depth and a periscope simulated. Submarines were expected to operate at a depth of 50–60m (164–197ft). The attackers were trained to fire salvoes of three bombs each (two 110lb, one 220lb), and also used cement practice rounds. If oil was seen the attack was deemed successful. SM 11 S specified the operational methods of attack against submarines.

In June 1941, the naval commander on Sicily wrote to Supermarina asking for a restructuring of the ASW service in terms of personnel and training. Eight older submarines should be assigned for hydrophone listening (this occurred only for a month) and hydrophones fitted to the seabed. On 10 August 1941 Supermarina created Mariantisom (Ispettorato dei mezzi antisommergibili, or 'Anti-Submarine Warfare Command') with its head office in Rome to organize, study and establish procedures, train personnel in technical and tactical matters, increase personnel quality and quantity, and improve communication with coastal command and co-operation with aircraft. Mariantisom started to collect data on sensor performance and decided to equip more destroyers and torpedo boats with ECG, and increase the number of operators (mainly submariners) by sending them to the German school at Gotenhafen on the Baltic coast. An NCO and three technicians operated the ECG on each ship and the Germans wanted Italy to send 17 NCOs and 50 technicians to attend, but the Italians thought that only one NCO and two technicians were needed as the NCO was also a trained technician. Also that month, an ASW school was established at La Spezia under the command of Ammiraglio di Divisione Alberto Da Zara.


R. Accademia Navale di Livorno.
Istruttore.

A caricature of an Italian instructor at the Accademia Navale di Livorno, the naval officer school established in 1881. The day started at 0530hrs and finished at 2130hrs. If students failed an exam they were given just one chance to pass a resit, otherwise they were thrown out. In 1940, 697 students were enrolled; in 1934 there had been 222 students. Personnel were told to follow detailed procedures written for every eventuality. (Author's collection)

Italian ratings sent to the ASW school at Gotenhafen on the Baltic coast undertook a six-week course divided into three phases: the first 8–10 days on technical principles and terminology, a few days at sea listening to emitting buoys, and then 25–30 days sea training against submarines and surface ships. The failure rate was 5–10 per cent. Five trawlers, five other ships and two submarines were available, and more submarines could be called upon from the operational units based nearby. Officers destined for service on ASW ships attended for eight days and were trained to attack submarines and use ECG. Practice bombs were used against a submerged submarine, which launched a smoking buoy to indicate its whereabouts. The Germans advised the Italians that the ASW inspectorate at Berlin received all reports from the flotillas and also from submarine units, collated them and sent lessons learned back to all flotillas and Gotenhafen. Every 3–6 months, flotilla leaders would gather together to discuss issues regarding ASW operational efficiency, discuss submarine activity and perfect the tactics to be used against submarines – a lessons-learned structure that would also be adopted by the Italians in 1942. (Author's collection)

COMMAND AND CONTROL

BRITISH

Submarines were organized into flotillas: the 1st at Alexandria, the 10th at Malta, and the 8th at Gibraltar. To protect convoys bringing in supplies to Malta, the Admiralty established a line of submarines. Mars would rather have brought them 'more closely together, rather than placing them about twenty miles apart', particularly as air reconnaissance provided good information, in order to force Italian destroyers 'to compete with more than one British submarine at a time' (Mars 1971: 165); however, Simpson dispersed them in order to force the enemy to disperse their ASW ships. Blamey described how 'sometimes a whole patrol would elapse with not a single ship sighted' (Blamey 2002: 167) and Mars stated 'An attack with torpedoes is usually the event of the month' (Mars 1971: 130). He experienced 'a long series of frustrations and anti-climax, punctuated only occasionally by the thrill of positive achievement' and described life 'as a dull, monotonous business … tempers grow short and nerves are frayed, and you curse the day that you volunteered to serve in these caricatures of sardine tins' (Mars 2008: 29–30). Crawford, less voluble, learned to deal with his frustration. On 24 March 1943 he attacked the merchant ship *Saluzzo* from 5,000yd with four torpedoes, but missed. He then had to evade three escorts – *Libra*, *Perseo* and *Tifone*.

Intelligence was 'of particular importance to submarines' (Simpson 2010: 130), because they were slow and inhibited in their movements; there were no intelligence officers, however, and lessons learned about Italian tactics had to be picked up during discussions in the mess. In the map room the locations of Italian ships were not specified, but ULTRA was decoding signals sent by the German Enigma machine and – because ULTRA was protected by the Allies – only ships that were identified by other means could be attacked. Reconnaissance aircraft, informed by signal intelligence, were repositioned while on patrol through a message using a mechanical encryption system called SYKO. Submarines were redirected based on reports from the aircraft. Francis H. Hinsley, Britain's official intelligence historian, asserted that ULTRA enabled the decisive interdiction of supplies: 'Of the 48 Axis ships sunk in the period from 2 June to 6 November [1942] … only one (766 tons) was not reported to the Middle East by GC and CS [ULTRA]' (quoted in O'Hara & Cernuschi 2013: 118). However, research by the historians O'Hara and Cernuschi shows how errors in decoding, translation or transcription resulted in bad information and how the Regia Marina's (Servizio Informazioni Segreto (SIS) read intercepted SYKO encryptions, often in less than an hour.

Short-wave radio messages were expected every four hours from the naval wireless station at Rugby and could be received while submerged. At a depth of 45ft the boat was pointed so that the bow or stern was within 40 degrees of the transmitter. A constant watch had to be maintained for other messages sent at any time. A long wire aerial was strung out along the length of the jumping wire to receive them. At first a telescopic mast was raised to transmit using high frequency (HF); two 30ft insulating cables, running forward and aft of the periscope standards and secured to the jumping wire at either end, replaced the HF mast when it was removed to make way for the 20mm bandstand. Sending messages on the surface risked 'detection and pinpointing by radio direction finders' (Mars 1971: 44), especially as a message took a couple of hours. HF submarine–submarine communication at distances of up to 3 miles was available through Morse code. (Cody Images)

BRITISH SUBMARINERS

CHARLES ANSCOMB

A boy sailor, Anscomb realized that 'The strict discipline and formality of life in a big ship may suit some men whose minds are set that way' (Anscomb 1957: 22), but he wanted to use his initiative and smaller ships, including submarines, held greater appeal for him. In 1928 he volunteered for submarines, but had to do three more years' General Service. In 1932 he started submarine training, and was told by an instructor: 'Each man in a submarine has a responsible job, and only the best men, those with real *initiative*, are good enough for us' (Anscomb 1957: 27). After four weeks of training studying how the valves and wheels controlled the submarine, Anscomb had a practical exam under the captain's gaze on operating the hydroplanes for depth and angle, and a written exam. He passed, and joined his first submarine. He soon moved on to *Sturgeon*. He was drafted to *Pandora* in Hong Kong and served in the torpedo compartment before moving to *Porpoise* in 1935. He then moved to *Sterlet* as the coxswain and in 1939 to *Parthian* in Hong Kong. *Parthian* arrived in Egypt in April 1940, one of 17 boats that arrived in Egypt that year.

Anscomb moved to *Tempest* in August 1941 as the coxswain, and later described how *Tempest's* hydroplanes 'were a dream of precision and dependability after *Parthian's* temperamental old flippers' (Anscomb 1957: 106). He described the boat as 'purely a lethal weapon, a precision tool for destruction', where crew comfort and storage space were trumped by 'the demands of more and better machinery and a smoother deadlier performance' (Anscomb 1957: 106). He was taken prisoner following the sinking of *Tempest* on 13 February 1942. After the war he served for a short time as an instructor before retiring.

ALASTAIR MARS

Mars entered the Royal Navy as a cadet in 1932 and joined his first submarine in 1936. Before World War II he served on *Swordfish* and *Regulus*, and in November 1941 was appointed captain of *Unbroken*. Upon assuming command he told his crew: 'I am the sole arbiter of what is good for you, and my orders are to be obeyed implicitly … You will learn more discipline with me than you dreamed of – the proper sort of discipline: self-discipline' (Mars 2008: 16). He told them that 'a bad order well executed leads to a better result than a good order ruined by indecision … a slackly obeyed order leads to confusion. In a submarine confusion means disaster' (Mars 2008: 16).

After a failed patrol on *Unbroken* in November 1942, Mars had nagging doubts and told Simpson he 'was good for perhaps four more patrols, but could not guarantee my nerves and strength beyond that' (Mars 1971: 200). Horton had told Simpson that tour length would be limited to a year for a submarine. *Unbroken* remained in the Mediterranean for four more months, but Mars was sent home. He 'felt guilty at having to leave behind the officers and men of my crew' (Mars 1971: 208), but believed it was the right decision. He was getting stale and was compromising the crew's survival because 'The success and survival of a submarine depends upon the sharp, keen, nerve-taut efficiency of every single member of her crew', including him (Mars 1971: 209). By 1950 he was ill and in debt; a request for leave on discharge from hospital was rejected and he was arrested, court-martialled for being absent without leave, and dismissed from the service in 1952. He then became a successful novelist. Alastair Mars died in 1985.

ITALIAN TORPEDO-BOAT CREWMEN

GIUSEPPE PIGHINI

Aged 20, Pighini attended the Accademia Navale di Livorno, graduating in 1931. In 1940, he was a *tenente di vascello* on the cruiser *Alberto Da Giussano* and then moved to become second-in-command on the destroyer *Granatiere* for six months. Promoted *capitano di corvetta* in mid-1941, he commanded *Calliope*, a Spica-class torpedo boat.

On 18 August 1941 *Tetrarch* tried sinking *Calliope* in Benghazi harbour, but all torpedoes fired went into the nets. On 19 August, *Calliope* –acting as an escort – successfully avoided two more torpedoes fired by *Tetrarch*. Frequent trips escorting merchant ships back and forth from Benghazi and Tripoli to Napoli and Taranto followed, punctuated by attacks from *Perseus*, *Ursula* and *Unbeaten*. On 2 October *Perseus* launched two torpedoes and hit *Castellon*, which *Calliope* was escorting, as the ships were approaching Benghazi. On 18 October, *Ursula* attacked a larger convoy of five merchant ships escorted by *Calliope* and five other escorts, sinking one merchant ship and damaging another. On 7 February 1942, *Unbeaten* unsuccessfully launched four torpedoes at the merchantman *Bosphorus* while she was being escorted by *Calliope*. By June, *Calliope* was in port in refit and had sonar fitted.

Awarded the *medaglie d'argento* (Silver Medal for Valour) for shooting down three Allied aircraft, Pighini remained in command of *Calliope* until July 1942. A move to the staff of Ammiraglio di Divisione Alberto Da Zara followed at the request of that officer. In early 1943 Pighini took command of a corvette flotilla in Sicily, winning another *medaglie d'argento* when his flotilla assisted in the sinking of a British destroyer. He escorted Allied convoys after the Armistice and returned to Ammariglio di Divisione Da Zara's staff later in 1943. After 1945 Pighini was the Italian naval attaché in Paris, a graduate of the US Naval War College in Newport, Rhode Island, and held the NATO appointment of Commander, Allied Naval Forces, Southern Europe (ComNavSouth).

VITALIANO RAUBER

Born in 1918, Sottotenente di Vascello Rauber served on *Lince*. In December 1941, *Lince* had ECG installed and Rauber was on board when the ship was tasked to hunt down the submarine that sank *Luciana*, hit by *Una* on 12 February 1942. The search was unsuccessful, however, because the ECG was not working, but on 13 February *Circe* found and sank the submarine *Tempest*. Escort missions in the Ionian Sea followed. On 14 August, *Lince* used up depth charges on a submarine mistakenly identified by an aircraft, and on 19 August caused some damage to *Porpoise* but had to disengage because no more depth charges remained. On 22 November 1942, *Lince* was damaged by an air raid on Tripoli which wounded the captain and many of the crew. There were no torpedoes, only one gun and a couple of machine guns functioned, and the ship's instruments were not working. With the fall of Tripoli imminent, Rauber, serving as second-in-command, was told to scuttle the ship, but – with the full agreement of his remaining crew – decided he wanted to return to Italy. On 18 January 1943, the attempt was made. On 19 January, *Lince's* two remaining functioning machine guns drove off an attack by a bomber off Kerkennah, and on 20 January off Tunisia *Unrivalled* launched torpedoes, which Rauber avoided. The ship arrived at Trapani safely. Refitted in Taranto and deployed to the Adriatic, *Lince* was eventually sunk on 28 August by *Ultor* while stranded on a beach near Crotone.

Rauber would have a distinguished career in Italy's post-war navy, the Marina Militare. In 1978 his official history of Regia Marina ASW operations was published. He would rise to the rank of *ammiraglio*, but in 1987 he was arrested and questioned about the illegal supply of weapons by the Marina Militare to Israel during the 1970s. He was subsequently released without charge. Vitaliano Rauber died in 1998.

Doctrine dictated strict adherence to Supermarina's orders, but mid-ranking officers often acted independently. Capitano di Corvetta Giuseppe Pighini thought 'it became incumbent on the man on the spot to make the final decision on whether or not to obey' (www.regiamarina.net). He described three occasions when he trusted 'my own judgement rather than blindly following orders. Although I had some explaining to do upon completing my missions, in the end I was praised for correctly interpreting the spirit of the orders issued to me' (www.regiamarina.net). When attacked by a British submarine, he was 'able to manoeuvre in time to avoid the torpedoes. I dropped some depth charges in the location where I estimated the submarine to be on the basis of the torpedo wakes, then returned to the convoy. I was worried that the submarine had had enough time to transmit our position … I had the convoy alter course and proceeded toward Pantelleria at best speed'; Supermarina ordered a different course, but Pighini 'maintained radio silence to avoid giving the enemy any further information concerning our position and intention' (www.regiamarina.net). (Author's collection)

ITALIAN

Torpedo boats were organized into *squadriglie* (divisions) of four ships, and two or three made up a *gruppo* (flotilla). Convoys doing 8–10kn needed 73 hours to transit from Marettimo Island off Sicily to Tripoli, which exposed them to night attack. Progress along the coast was particularly slow, at 5–8kn, and travelling from Tripoli to Benghazi took seven days. In 1943 the route from Napoli to Tunis or Bizerte involved a shorter transit time, but most merchantmen still needed 36–45 hours to complete the journey; they departed at night to arrive at dawn, unload quickly and then depart.

Formation was line abreast, but inexperienced captains often mistakenly fell into 'chequerboard' formations that made better targets. Escorts were positioned 1 mile ahead and staggered by 45 degrees. The majority of the merchant ships did not have very high frequency (VHF) radio installed; wireless telegraphy was available, but encryption was not because there were no facilities to decipher messages on merchant ships. Megaphones or signal flags were relied upon until more short-wave radio sets were installed in mid-1941.

SIS Section B, which grew from 24 personnel in 1940 to over 200 in 1942, intercepted and deciphered enemy radio communications. In 1940–43, 13.3 per cent of British radio traffic was deciphered – slightly less than the 13.75 per cent achieved by British code-breakers. Changes of course and destination were plotted in the situation room, which was situated down the corridor from Section B. Convoys were ordered to change course to avoid enemy aircraft or after they were spotted, through communications that used pre-arranged hidden meanings for uncoded messages. High-grade encryption with the SM 16 S (Stato Maggiore 16 Segreto) or the SM 19 S was also used. The former had 45,000 groups, the latter 16,000, and neither was broken; by late 1941, however, the C38m machine cypher – used at times instead of the telegraph for messages to Libya – had been broken.

Blamey described 'an ever-present smell of diesel fuel permeating throughout the boat, mingling with the acrid stench of battery gas' (Blamey 2002: 20). Mars wrote that 'there was not even the pretence of privacy in the shoulder-rubbing, breath-down-the-neck confines of a submarine' (Mars 2008: 14). Some crew were lucky to have settees to sleep on, while 'the remainder had to bed down as best they could in the for'ard torpedo-room' (Mars 2008: 30), as shown here. Able Seaman Ron Slade, a submariner, described how men had to compete with provisions for space and 'When there was a need for torpedo maintenance everything had to be cleared out of the way to the great annoyance of all' (quoted in Kemp 1990: 67). Neat rum was issued daily and while all sale, loan, transfer, gift or barter of spirit was officially proscribed, was often sold. Many submariners suffered from calcium deficiency because of poor diet and no Vitamin D (ultra-violet light treatment was available at rest camps). A medical officer, Lieutenant J.S. Wraith, reported after a patrol during bad weather on *Upright* that 'twelve days at sea is the maximum compatible with any degree of efficiency' (quoted in Wingate 1991: 75). Surgeon-Lieutenant A.F. Crowley observed aboard *Una* that 'The cramped accommodation, close contact with the messmates and lack of exercise all play their part in setting up a state of nervous tension' (quoted in Wingate 1991: 229). After 24 hours, oxygen started to run out and carbon dioxide was building, resulting in a 'slowing of the mental processes, together with creating irritability and shortness of temper'; he thought the crew behaved calmly during depth-charge attack because 'atmospheric conditions had slowed down the intellect' (quoted in Wingate 1991: 229). Blamey expected his time would be up at some point, but perhaps his fatalism was explained by the fact that he was older than the majority of the sailors. (Cody Images)

TACTICS

BRITISH

For many submarine captains there was a balance between being able to hit and being able to escape – 1,000yd was close enough, but for Crawford when he commanded *Unseen*, despite plenty of Italian warships having sonar, it was important to get among the escorts to hit the merchant ships and then trust to luck. By mid-1942 a submarine captain had to presume that any escort could have sonar fitted, and avoidance was thus the priority. In the summer months ASDIC conditions deteriorated; the enemy's sonar would not work as effectively and so a submarine captain could try to present less of a target.

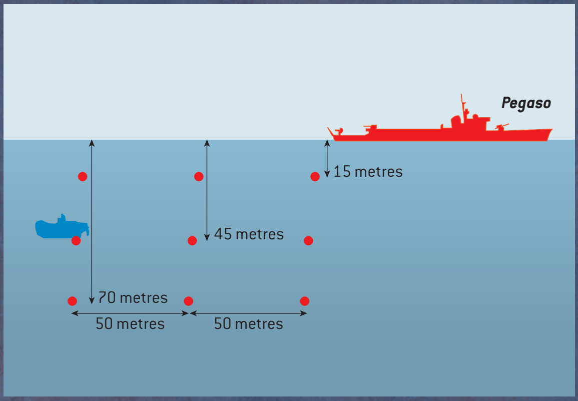
If a submarine was found or a successful attack betrayed its presence, preparations were made for withstanding a depth-charge attack. Silent routine was adopted, which meant 'proceeding along very slowly on one motor, just keeping enough way on the boat to provide sufficient rudder and hydroplane control, these being operated in hand control in order to eliminate the noise of the operating motors' (Blamey 2002: 159). When a depth charge exploded nearby, 'a sharp crack, as of a giant hammer, struck the pressure hull, followed by a frightful reverberating roar' (Young 2004: 39). Their nearness could be judged by the ability to hear 'rain' – gushers of water falling back into the sea after an explosion. Another indicator was hearing a metallic 'click' just before the explosion, caused by the firing mechanism. After firing, Crawford recalled, the submarine 'would go deep and try to creep away. You would hear the enemy Asdic and want to get away quick by going straight, unless you were being attacked when you would then move around hoping to put them off.'

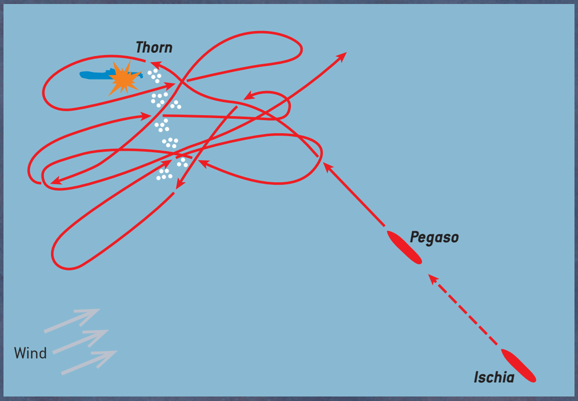
ITALIAN

Once a submarine was spotted, a torpedo boat would usually launch four bombs by throwers, each with a lethal radius of 33ft and a damage radius of 82ft, but a hit was the result of chance. During the night, submarines had an advantage because they had sensors including radar, which gave lookouts an indication of where to look; also, a conning tower could be seen from about 1,000yd, while on a bright night a ship was visible 4,000–5,500yd away. A surfaced submarine at night was faster than a convoy and could choose where to attack, but on board a ship it was difficult to see from where an attack was being made.

In his report to Supermarina on the attack on *P 38*, Capitano di Corvetta Stefanino Palmas of *Circe* noted how it 'was carried out with almost lightning speed … by the almost immediate dropping of all depth charges … The explosion had hit the submarine, which was in rapid dive. It was so strong that the enemy commander could do nothing else but surface immediately and give pressurised air on all tanks' (quoted in Rauber 1978: 204). Palmas violated regulations by using 11 depth charges at once, and noted how 'The explosion of a depth charge packet is extremely strong. The hull of the torpedo boat had vibrated noticeably, but not too much' because the speed of the attack was restricted; furthermore, 'The rapidity of the attack had excited the crew beyond belief' (quoted in Rauber 1978: 204).

Axis air superiority 'interfered considerably with our activities by putting the submarine deep and preventing use of the periscope' (Mars 1971: 170). In 1939, the Regia Marina thought aerial search was the best method of submarine detection; 150–200m (500–650ft) was considered to be the best altitude at which to fly in average weather. As normal aircraft were too fast for observation to be effective, the Regia Marina operated slower reconnaissance hydroplanes (but only 100); Italy's air force, the Regia Aeronautica, was further hampered because little training was given to its pilots in how to navigate over sea. There were few radios, and if a convoy changed course it was difficult for a new shift of aircraft to locate it, especially in low cloud or limited visibility. These problems meant that 'convoys were sometimes escorted by very few aircraft or only over a short section of the route. Some had no escort at all' (Cocchia 1958: 128). Here, a CANT Z.501 Gabbiano flying boat has landed in a North African harbour. (Bundesarchiv Bild 101I-424-0282-08 Foto: Böcker)





ITALIAN ASW TACTICS: *PEGASO* VS *THORN*

Pegaso, commanded by Tenente di Vascello Mario De Petris, sailed from Benghazi on 6 August 1942, escorting the steamer *Ischia*. At 1255hrs on 6 August, 30 miles south-west of Gavdos Island, a Ju 88 was observed machine-gunning an area of sea and *Pegaso* went to investigate. At 1258hrs a good contact was made with *Thorn* (Lieutenant Commander R. Norfolk) on ECG off the bow at 1,500yd. Seven attacks were made from 1258hrs until 1347hrs, after which ECG contact was lost and oil was observed. De Petris reported that 'after the second bombardment her speed had reduced noticeably and shortly afterwards traces of oil were seen' (quoted in Evans 2010: 324). A rapid response to close on a firing location was adopted by boats without sonar; those boats with sonar conducted a more gradual and meticulous search for the submarine as their surface speed was greater than the submerged speed of the submarine, and De Petris carried out seven attack runs.

A periscope that showed itself briefly from 1,000–2,000yd was unlikely to be spotted from a ship. Before ECG was fitted, a submarine's presence was only detected in the majority of cases after an attack by observing a torpedo's wake – if the ship was not the target or the torpedo missed – which should be identified approximately 1 minute after launch. Some 2½–3 minutes were then needed to close with the submarine's launch position. According to Italian reports, depth charging was never started less than 3 minutes from sighting the wake, and more like 5 minutes. In this time, submarines could move anywhere in a radius of 325ft depth and 325yd distance from the launch position. A successful depth-charge hit was thus a matter of luck as much as judgement.

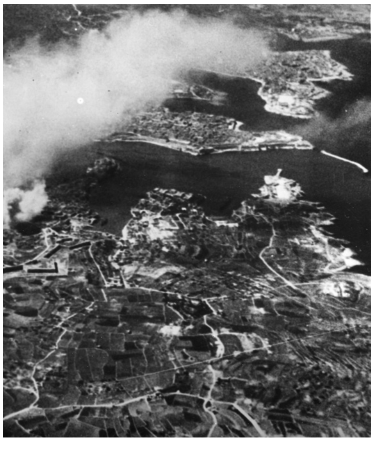
In the case of *Pegaso* vs *Thorn*, at 1255hrs a Ju 88 was seen machine-gunning an area of sea. (Escorting aircraft could also provide assistance by spotting for the torpedo boats and signalling a submarine's presence by dropping a bomb.) When De Petris reached the area, he observed 'A periscope which left a wake visible at a considerable distance despite the ruffled surface of the sea' (quoted in Evans 2010: 323). The periscope moved across to the port side and after 2 minutes disappeared from view. De Petris thought it unusual that the periscope stayed above the surface longer than normal, and there is a suggestion that Allied aircraft had attacked a submarine earlier in the day.

Depth charges could either be launched from a thrower or rolled off the stern. *Pegaso* had three throwers each side, which could be reloaded, and four stern rails. Here, *Pegaso* is illustrated as having launched three depth charges with each of the three starboard depth-charge throwers to form a pocket that was designed to catch the submarine. After a surprise depth-charge attack against *Unseen* in December 1942 off Toulon, the submarine started plummeting, but Crawford was reluctant to use his tanks to surface because the presence of the submarine would be given away and he had to choose the right time carefully. Eventually, with 'Q' tank damaged, he decided to use two main ballast tanks and held the submarine at 345ft, way below normal operating depth. Norfolk may have blown his tanks earlier as *Pegaso*'s skipper, Tenente di Vascello Mario De Petris, reported the presence of air bubbles; also, no torpedoes were seen by De Petris and Norfolk may not have had the opportunity to attack. If Norfolk could have attacked and hit *Ischia* then he would have had a better chance to escape; normally one of the escorts would attend to a stricken ship, while any others would attempt to attack the submarine. In this case there was only a single escort.

THE STRATEGIC SITUATION

THE SETTING

Italy was centrally positioned astride British trade routes from Gibraltar to Suez; the mainland, Sicily and Sardinia were to the north of the Mediterranean's central basin and Libya to the south. The narrow channels that transited the area around Sicily were all within range of Italian aircraft flying from airfields. Resupply routes from the Italian mainland to Tripoli, the main Libyan port, bypassed Malta, and an Italian study in 1938 specified the invasion or neutralization of the island as 'an indispensable premise for the success of any major operation in North Africa' (quoted in Mallett 1998: 133). To the west, along the Tunisian shore, shoals and reefs made navigable channels narrow and were likely locations for minefields. The eastern route was longer and more vulnerable to interception from British naval bases in Egypt, but was preferred by faster ships: it was further from aircraft based on Malta, and there were fewer minefields and greater room for manoeuvre. Submarines, running the risk of minefields, would stand off ports of arrival



Malta proved vital in the struggle for the central Mediterranean in World War II. Ammiraglio di Squadra Inigo Campioni (the Regia Marina's deputy chief-of-staff, 1938–39) thought assaulting Malta would incur too heavy losses, and so did not develop detailed plans to capture the island. Italian planners thought the defences were strong; in 1939, however, a British military committee hoped only that 'the garrison would be able to hold out until relieved' (quoted in Mallett 1998: 182). Here, an aerial photograph of Malta during a German air raid shows the harbour. The eastern side of Manoel Island, where the submarine base was located, is visible in the middle harbour near the top of the photograph; the rest of the island is under cloud. (Bundesarchiv Bild 146-1977-056-07 Foto: Kamm, Richard) or departure to have more chance of intercepting them. When ships used coastal routes, however, attacking them with torpedoes was made more difficult due to the coastal currents pushing them off their intended path.

The blueness of the sea meant that submarines were visible at a depth of 65ft and they were painted blue to camouflage them. This made the use of aircraft as spotters especially important. A periscope's wake could also betray the presence of a submarine, especially in fine summer weather. Also, while maintaining periscope depth, because the density of seawater could change as a consequence of temperature differences in different depths and also in channels between islands and the mainland, Anscomb wrote of how 'a submarine may suddenly sink in a thinner patch and go blind at a crucial moment, her periscope dipping beneath the surface' (Anscomb 1957: 81). The size of the older boats made them particularly noticeable, which was why the smaller U-class boats were in demand.

Both sides found it difficult to use sonar in the Mediterranean, but this normally favoured the British. High evaporation of water in the summer and inflow from the Black Sea and Atlantic meant 'there is an admixture of varying densities which tend to conglomerate into layers', which submarines used to hide under; by June 'asdic conditions deteriorate and thereby the submarine has a distinct advantage which she loses between the autumn and spring' (Mars 1971: 123). Stratification during the summer limited ranges to 750–875yd, rather than 3,250yd.

The British submarine base on Malta was located on Manoel Island. In 1934, a £350,000 proposal for docking facilities for six submarines, all housed under 200ft of rock, was rejected; the 500ft-long two-storey building that did exist was protected to the north by sheer rock, however. Oil-storage tanks and the torpedo depot were also under rock. Smaller submarines, berthed at buoys a few yards offshore, were reached by pontoons. The base was not singled out for air attack during January–May 1941, despite captured maps showing a '*U-boathausen*'; a German air raid on 6 March 1942 seriously damaged *P 39*, however, and all submarines were ordered to spend the daylight hours submerged. By July 1941, 30,000 men, 80 fighters, 100 bombers and 1,400 anti-aircraft guns were stationed on Malta; resupply efforts involved losses, and in 1941 and 1942 only 49 of 82 ships sent to the island made it, despite large escorts. In June 1942 Generale Ugo Cavallero – Italy's chief of the defence staff from 6 December 1940 – told the Germans an invasion of Egypt was meaningless without seizing the island. Cavallero would have accepted an invasion of Tunisia, but Tunis was of less interest because of its distance from the front. (Cody Images)

THE BRITISH PERSPECTIVE

In June 1940, Britain was alone. The western Mediterranean was the responsibility of France's Marine nationale (a small force of Royal Navy destroyers was based in Gibraltar) and with France's defeat, Italy no longer had the French Mediterranean Fleet to deal with; furthermore, bases in Tunisia no longer threatened Italian resupply efforts to Libya. Malta, although well positioned along these supply routes (190 miles from Tripoli) and having a submarine base, was thought to be indefensible. The main base of the Royal Navy was at Alexandria in Egypt and along with four battleships, ten submarines were based there. A large Italian army in Libya threatened the port and Suez, and there was only a small but mobile force in place to oppose them. The British had to send reinforcements 12,000 miles around the Cape of Good Hope.

The majority of the submarines were recalled from the Far East in April 1940. Their new operating environment was very different, but their captains had no experience of the Mediterranean. The O, P and R classes were thought to be too large for the anti-shipping role, but their range did allow them to reach Taranto from their distant base at Alexandria 850 miles away. In 1940 the majority of traffic to Libya travelled to the Tunisian shore and then along the coast to Tripoli, where supplies were

In December 1938 the Italian naval staff issued its first serious study of convoy operations and highlighted the limited capacity of Libyan ports to offload supplies: Tripoli could unload five cargo ships and four troop ships at a time (3,500 tons per day), and Benghazi three and two (700 tonnes), respectively. At the ports of departure, Napoli could load 14 ships, and Bari and Brindisi five each. These figures did not account for wartime disruption. Here, basic unloading facilities at Tobruk harbour are shown. The Regia Marina would be hobbled by fuel restrictions. In the summer of 1941, Italy was able to negotiate from Germany 100,000 tons of fuel per month, but during July–September 1941 only 64,073 tons arrived (convoys needed 175,000 tons every three months). By the summer of 1942, at Benghazi two torpedo boats would be emptied to fuel three others; and two of Tripoli's four torpedo boats could not operate because of a lack of fuel. In February 1943, Vizeadmiral Weichold told how 'the fuel oil situation had now touched rock bottom and the naval units stationed in southern Italy for escort service frequently had to wait several days for their fuel supply. There were days in which, throughout all Sicily, there was not even a ton to be found' (quoted in Bragadin 1957: 247). (Bundesarchiv Bild 101I-785-0298-02 Foto: Valtingojer, Klemens)

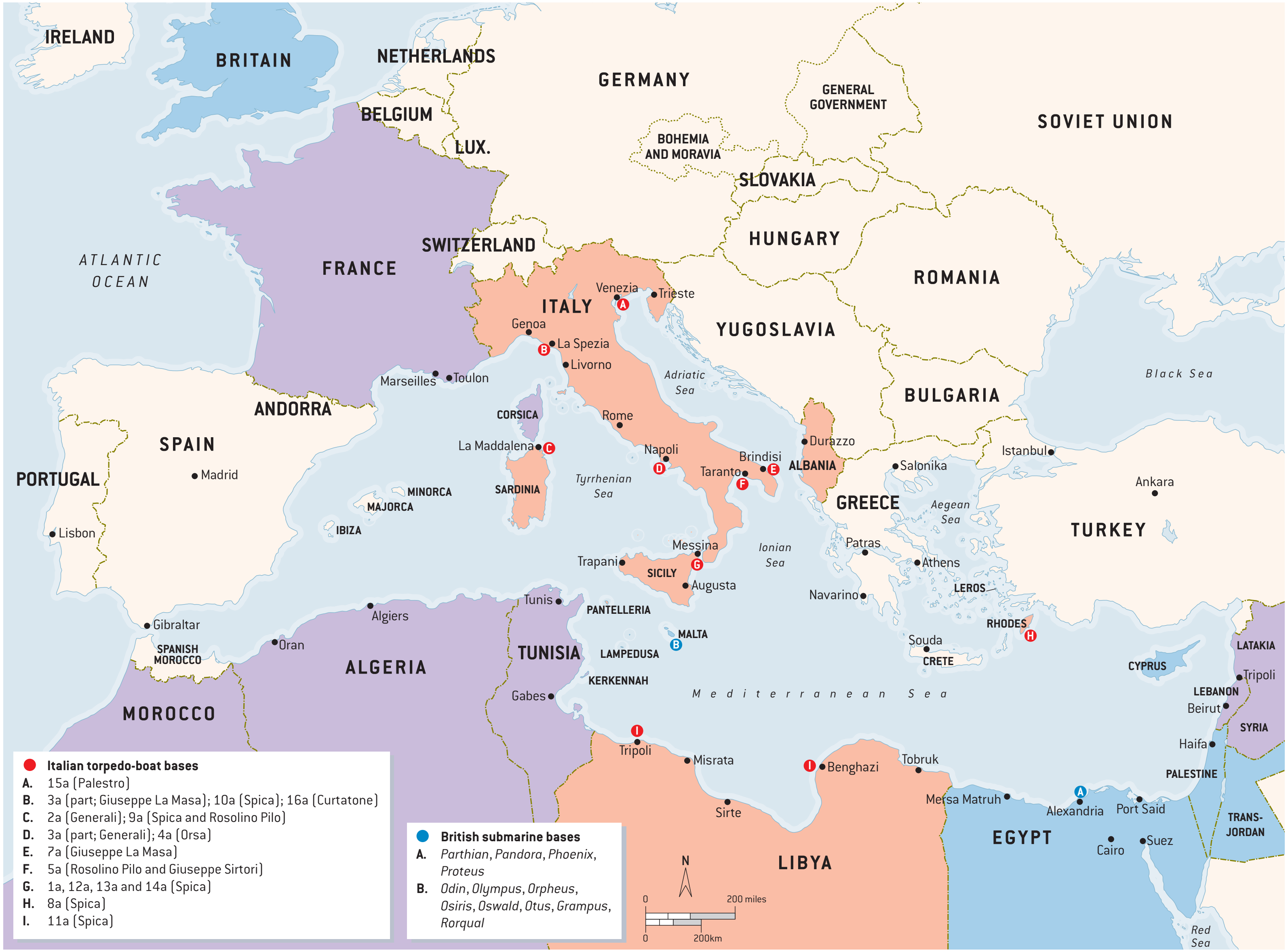
loaded on to smaller ships to move up the Libyan coast. Only in December 1940 were submarines redirected to Tunisia. Furthermore, to prevent sinking neutrals, 'stop and search' rules were adopted for single merchant ships and those that were part of unescorted convoys, although sink-at-sight zones within 30 miles of Italian territory were established. This meant that submarines had to operate in well-patrolled inshore routes – particularly difficult for larger boats. Only on 21 February 1941 were the rules changed and previous restrictions on targeting in the central Mediterranean removed. The U-class boats were all deployed to Malta from where their short endurance and low surface speed did not put them at a disadvantage. Five of eight T-class boats were also initially dispatched, but they were also in demand off northern France and Norway and only another two were deployed up to mid-1941.

THE ITALIAN PERSPECTIVE

Mussolini always wanted an empire, but he realized that imperial expansion would 'invariably meet with the direct opposition of Great Britain' (quoted in Mallett 1998: 51). By the early 1930s Italy's military expenditure accounted for 5.6 per cent of the budget, but the country imported 75 per cent of its coal, 85 per cent of its iron and 100 per cent of its fuel. By January 1940 only 1.58 million tons of fuel was stockpiled, but average monthly wartime consumption was 200,000 tons. Libya, acquired by Italy following war with Turkey in 1912, needed supplies from Italy to function, and in 1940 had only six months' worth stockpiled.

During the build-up to war, Italian military directives focused on defending overseas territories rather than offensive operations. In June 1940 France's collapse persuaded Mussolini to enter the war, but there were no realistic offensive options. The Regia Marina, with its naval programmes incomplete, 'could do little more than attempt to defend the Strait of Sicily from the overwhelming might of Allied sea power' (Mallett 1998: 159), and thought protecting troop convoys to North Africa needed nearly the entire battle fleet. In June 1940 the Regia Marina had two operational battleships (with four more joining at the end of summer and another two building), seven heavy and 12 light cruisers, 59 destroyers and 33 old and 34 modern torpedo boats (30 Spica and four Orsa) plus the submarine chaser *Albatros*. Furthermore, 20 per cent of merchant ships over 10,000 GRT (6 of 30) and 58 per cent over 6,000 GRT (64 of 111) – in total, 1.2 million GRT – were caught in foreign ports and unable to return home. This loss represented 'some of our best, largest and fastest ships' (Cocchia 1958: 131) and smaller ships had to make up for the shortfall, despite 35 per cent (136 of 392) of ships of 2,001–6,000 GRT also being lost.

OPPOSITE This map shows the theatre of operations and the deployment of Italian torpedo boats and British submarines at the beginning of the campaign. On 10 June 1940 there were 12 British submarines in the Mediterranean, based at Malta or Alexandria. From mid-1941, four Italian torpedo boats would be based at Souda on Crete and 14a Squadriglia Cacciatorpediniere would be based at Navarino and Patras in Greece.


IRELAND
BRITAIN
NETHERLANDS
BELGIUM
LUX.
GERMANY
GENERAL GOVERNMENT
BOHEMIA AND MORAVIA
SLOVAKIA
SOVIET UNION
HUNGARY
ROMANIA
SWITZERLAND
FRANCE
ATLANTIC OCEAN
ITALY
Venezia
Trieste
Genoa
La Spezia
Livorno
YUGOSLAVIA
Adriatic Sea
Black Sea
BULGARIA
Marseilles
Toulon
ANDORRA
CORSICA
Rome
SPAIN
PORTUGAL
Madrid
Lisbon
La Maddalena
Napoli
Brindisi
Taranto
Durazzo
ALBANIA
Salonika
Istanbul
Ankara
MINORCA
MAJORCA
IBIZA
SARDINIA
Tyrrhenian Sea
GREECE
Aegean Sea
TURKEY
Messina
Trapani
SICILY
Augusta
Ionian Sea
Patras
Athens
Navarino
LEROS
RHODES
Tunis
PANTELLERIA
Gibraltar
SPANISH MOROCCO
Algiers
Oran
ALGERIA
TUNISIA
LAMPEDUSA
MALTA
Souda
CRETE
CYPRUS
LATAKIA
Tripoli
LEBANON
Beirut
SYRIA
KERKENNAH
Gabes
Mediterranean Sea
MOROCCO
Tripoli
Misrata
Benghazi
Tobruk
Sirte
Mersa Matruh
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Cairo
Suez
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● **Italian torpedo-boat bases**

- **A.** 15a (Palestro)
- **B.** 3a (part; Giuseppe La Masa); 10a (Spica); 16a (Curtatone)
- **C.** 2a (Generali); 9a (Spica and Rosolino Pilo)
- **D.** 3a (part; Generali); 4a (Orsa)
- **E.** 7a (Giuseppe La Masa)
- **F.** 5a (Rosolino Pilo and Giuseppe Sirtori)
- **G.** 1a, 12a, 13a and 14a (Spica)
- **H.** 8a (Spica)
- **I.** 11a (Spica)

● **British submarine bases**

- **A.** *Parthian, Pandora, Phoenix, Proteus*
- **B.** *Odin, Olympus, Orpheus, Osiris, Oswald, Otus, Grampus, Rorqual*

COMBAT

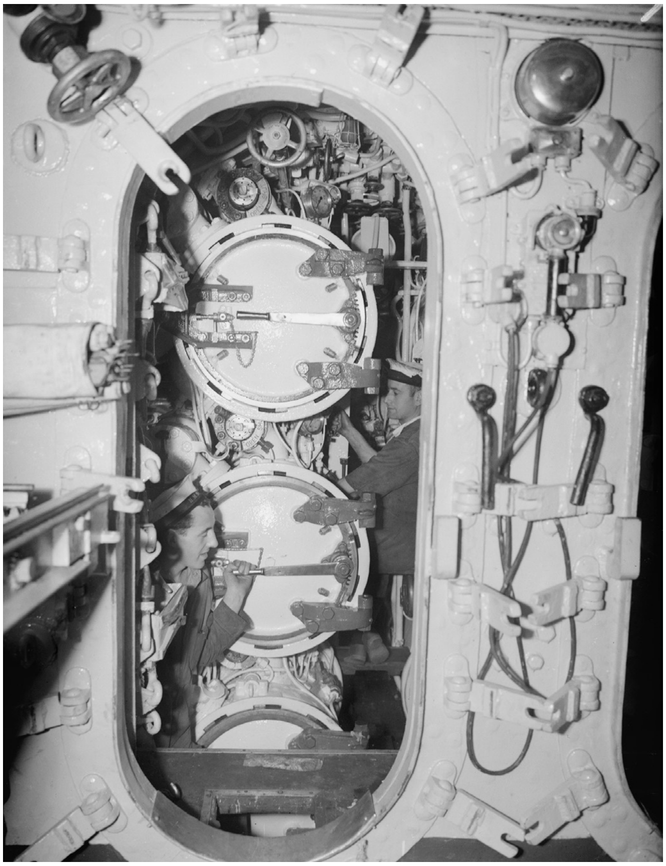
JUNE–DECEMBER 1940

In June 1940 Britain relied on the O-, P- and R-class submarines that had made long, tiring journeys from the Far East earlier in the year. By the end of May, *Odin*, *Olympus*, *Orpheus*, *Osiris*, *Oswald*, *Otus*, *Phoenix*, *Proteus*, *Pandora*, *Parthian*, *Grampus* and *Rorqual* were in the Mediterranean; *Regulus*, *Regent*, *Rainbow*, *Perseus* and *Rover* would join them. The U-class boats would start to arrive in December; in the meantime four T-class boats – *Truant*, *Triad*, *Triton* and *Tetrarch* – were on patrol by September.

On 13 June, *Grampus* (Lieutenant Commander C.A. Rowe) was laying mines off Augusta in Sicily and stayed in the area; on 16 June, 13a Squadriglia Cacciatorpediniere (*Circe*, *Clio*, *Calliope* and *Polluce*) commanded by Capitano di Fregata Aldo Rossi on *Circe* made an ASW sweep at 25kn. At 1902hrs, Rossi raced towards the area of a periscope sighting 60yd to port and at 1904hrs launched depth charges. Tenente di Vascello Agretti, commanding *Clio*, followed and dropped more. On *Polluce*, Tenente di Vascello Radovanni observed two torpedoes heading towards him; both missed, with one passing close to the bow and the other to the stern; Tenente di Vascello Bettica, the captain of *Polluce*, launched depth charges and the ninth charge, 110lb regulated for 165ft, destroyed *Grampus*. A column of water with black foam and wreckage was thrown up. *Polluce* happened to be in the right place at the right time. Rossi's *squadriglia* reacted with speed to the sighting, successfully manoeuvred in a small area, and launched 61 depth charges.

Albatros (Capitano di Corvetta Alessandro Mazzetti) was similarly successful due to a rapid response once a submarine (in this case *Phoenix*, commanded by Lieutenant Commander G. Nowell) was detected. At 1252hrs on 16 July off Augusta lighthouse, Mazzetti, escorting the tanker *Dora C.* to Augusta, sighted two torpedo wakes fired from 1,500yd, one passing forward and the other close to the stern, probably launched against the tanker. *Albatros*, with her ECG not working, sped down the wakes at 24kn and launched ten depth charges. *Phoenix* was no more than 100yd from where the torpedoes had been launched. No sinking was claimed, but air bubbles were observed; *Albatros* may have mistaken the torpedo attack for dolphins, however. Nowell had been ordered back to base on 14 July, which he had acknowledged; an Italian minefield lay 4 miles south-east of Augusta, and *Phoenix* may have foundered here.

The T-class boats were also having difficulties. On 18 December Tenente di Vascello Pasquale Giliberto, commanding *Clio*, attacked a submarine; perhaps it was *Triton*, commanded by Lieutenant G.C.I. St B.S. Watkins, but Watkins had been expected back on Malta the previous day. The British claimed the submarine was sunk by mines. Some 12,900 mines had been laid in June 1940, the majority outside major Italian ports, and the approaches to some Libyan ports. On 9 November 1940 *Rorqual* had laid mines off Cape Misrata that sank *Calipso* and *Fratelli Cairoli* on 5 and 23 December, respectively. In total, only nine merchant ships, one submarine and one torpedo boat were sunk in this period for the loss of nine British submarines.



A view of the three port forward tubes on *Osiris*. Losses of older submarines were severe, but they did have some success. During an attack on a convoy on 22 September 1940, *Osiris*, under Lieutenant Commander J.R.G. Harvey (ret'd), sank *Palestro*, which was acting as an escort, with a torpedo 40 miles north-west of Durazzo, Albania. (© IWM A 18076)

JANUARY–JUNE 1941

After a desultory Italian attempt to invade Egypt in September 1940, a British counter-attack captured Benghazi and threatened Tripoli, which prompted the Germans to send the Deutsches Afrikakorps to Libya from February 1941 and the Italians the Ariete and Trento divisions. With Tobruk in British hands from January 1941, more Axis supplies were sent to Tripoli along the western route and then shipped along the coast on smaller ships; without Tunisian bases, these vessels were vulnerable to attacks by aircraft and submarines from Malta and submarines based in Egypt and at Gibraltar. To maintain 164,000 Axis troops and 100,000 civilians in Libya, 80,000 tons of supplies were needed every month as well as 60,000 tons of fuel. Another 110,000 men, 18,500 vehicles and 900 guns were also due to be transported there. From February to May 1941, on average 40 ships were sent per month (eight were lost in

Here, a U-class submarine is departing Malta. By June 1941, seven U-class boats were at the island: three patrolled off Messina and four between the Kerkennah Bank and Lampedusa. The number of submarines reached 12 for a short time, with on average 3–4 at sea. By 1942, engineers called for defect reports before submarines returned to base in order that spare parts could be readied. A night out in Malta offered rubble and air raids, and some men stayed on base during leave or went to rest camps organized by Simpson. Mars allowed them to 'enjoy themselves today on shore so long as they do not get into any serious trouble' (Mars 2008: 99), but complained how 'rations were usually poor, basically inadequate and lacked the vitamins and other ingredients essential to the re-establishment of good health after a long patrol' (Mars 1971: 130). At Gibraltar, the environment was much better; Young 'could not get over the delightful feeling of being on perpetual holiday' (Young 2004: 95). (Captain M.L.C. Crawford RN)

April, eight in May and five in June); this increased to 74 ships in July with only four lost. Italy's pre-war plans to neutralize Malta by naval blockade and air attack were implemented: in December 1940; Luftwaffe elements began transferring to Sicily, and by January 1941, 54 Ju 87 dive-bombers, 32 He 111 bombers and 13 Bf 110 fighter-bombers were based there.

In early 1941 *Triumph* joined *Truant*, *Tetrarch*, *Rorqual*, *Regent*, *Rover* and *Parthian* at Malta. On 25 March *Rorqual* had laid mines off Cape Gallo, Sicily, that sank *Generale Antonio Chinotto* on 28 March. Operating from Egypt, the 1st Submarine Flotilla covered the area east of the Gulf of Sirte, especially Benghazi, captured by the Germans in April. In May another four U-class boats arrived, and attacked off the Tunisian and Libyan coasts and also southern Sicily and south of the Strait of Messina, but with limited success.

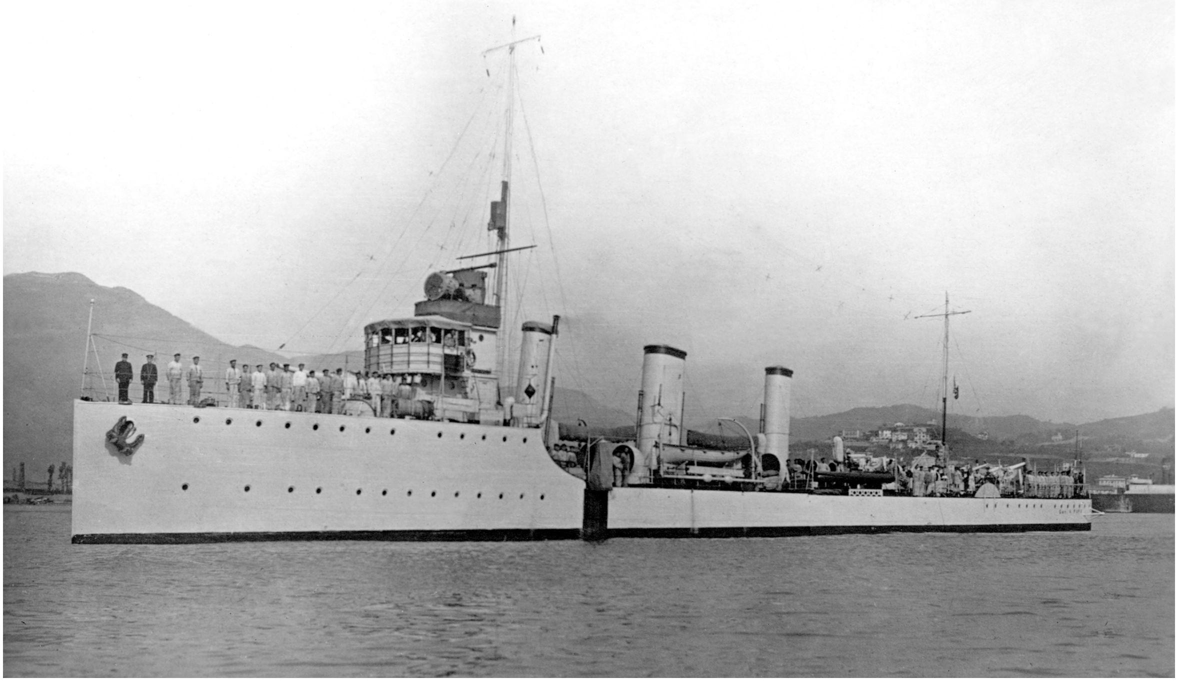
On 2 May, *Undaunted* (Lieutenant J.L. Livesey) was directed north of Tripoli. On 12 May, a day after *Undaunted* was due back (technical problems might have delayed her return), *Pegaso*, *Clio* and *Orione* sailed from Tripoli as escorts along the coast to the merchant ships *Maddalena Odero* and *Nicolo Odero*. At 0840hrs the escort aircraft detected a submarine to seaward, and *Pegaso* departed to hunt it. Oil was seen after an attack with depth charges, but mining at some time earlier could have been a potential cause of *Undaunted*'s loss.

JULY–DECEMBER 1941

Much of the rest of 1941 represented a downturn in Italian fortunes, with the amount of fuel shipped per month dropping from 35,010 to 5,731 tons. The British offensive, Operation *Crusader*, made the arrival of Axis supplies imperative; a heavily guarded convoy set out from Napoli on 16 December, however, and a naval battle in the Gulf of Sirte neutralized the threat of the British fleet in the area. On 19 December, the Malta-based ships stumbled into a minefield off Tripoli; from October to December, 19 German U-boats arrived, sinking the British battleship *Barham* and aircraft carrier *Ark Royal*; on 19 December, the British battleships *Valiant* and *Queen Elizabeth* were severely damaged in Alexandria harbour by limpet mines attached to their hulls by Italian manned torpedoes; and the Luftwaffe would return to attack Malta in January 1942. All these developments would help to re-establish Italian naval supremacy on the convoy routes.

On 17 July, the German steamer *Menes*, escorted by *Circe* (Capitano di Corvetta Carlo Unger Di Lowenberg), departed Tripoli for Trapani. At 1118hrs on 20 July, south-west of Pantelleria, *Circe*, zigzagging ahead, sighted a torpedo wake 3,000yd to the north-west and, according to Lowenberg, 'increased speed to twenty knots for a depth-charge attack. Turning to port under full rudder, she dropped six charges over the source of the slick, the settings being 50, 75, and 100 metres [164, 246 and 328ft]'; then at 1131hrs, 220yd from *Circe*, 'a gigantic bubble of air from the submerged submarine erupted on the surface. Three more 100kg [220lb] charges were dropped at short intervals' (quoted in Wingate 1991: 82). The escort seaplane reported a large bubble of air at 1142hrs, 165yd from where *Circe* last attacked, and, according to the pilot, 'released a bomb from 200 metres [650ft]. It exploded exactly at the point wanted' (quoted in Evans 2010: 276). He observed a large patch of oil. The submarine was *Union* (Lieutenant R. Galloway).

P 33 (Lieutenant R. Whiteway-Wilkinson) arrived at Malta on 6 July and on 11 July sailed on patrol. At 1407hrs on 15 July, a convoy heading from Napoli to



The ship that Lieutenant H.R.B. Newton RN, the captain of *Cachalot*, thought was a tanker (see page 54) was actually the torpedo boat *Generale Achille Papa*, shown here in pre-war colours; Newton observed that 'Dense clouds of smoke appeared amidships [thought to be caused by a hit from *Cachalot*'s deck gun] and the enemy appeared to be altering course towards us ... I commenced to turn away … The enemy was lost to sight almost at once in the smoke. One minute later a destroyer [*Generale Achille Papa*] appeared … at full speed and firing all available guns' (quoted in Evans 2010: 279). Newton continued: 'the first indication she had had of us was when two shells passed between her funnels. The smoke thought to be caused by a hit was in fact a smokescreen' (quoted in Evans 2010: 282). *Generale Achille Papa* was captured by the Germans in Genoa in September 1943. (Cody Images)

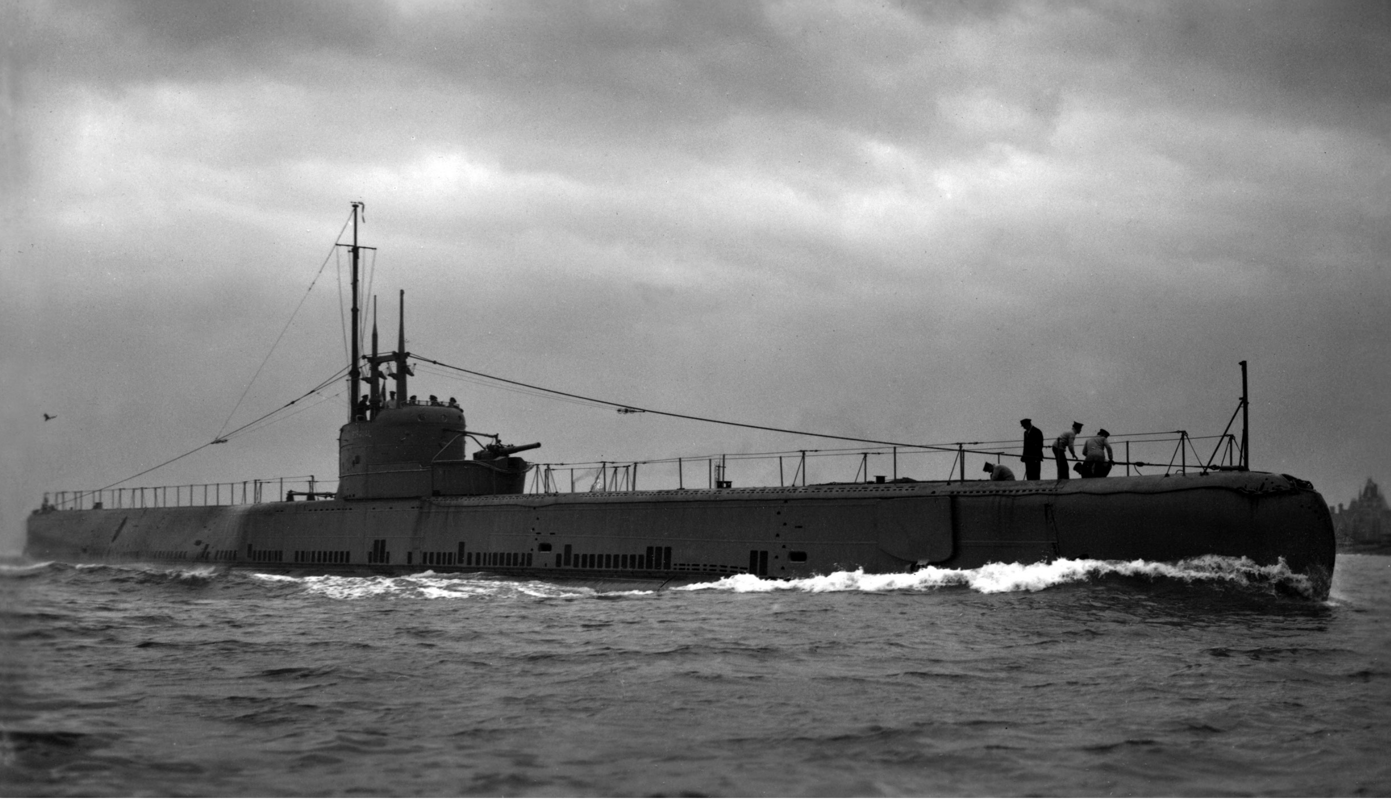
Tripoli was spotted: five half-laden merchants in two columns of two ships each in line ahead, with one more ship leading in the middle of the columns. They were escorted by the destroyers *Lanzerotto Malocello*, *Fuciliere* and *Alpino*, the torpedo boats *Procione* and *Pegaso* and the escort *Orsa*; a pair ahead and another pair on each quarter. At 1439hrs, four torpedoes were fired from 2,500yd at the leading ship of the starboard column (*Barbarigo*). Two hits were heard about two minutes after firing. *Fuciliere* and *Alpino* immediately launched depth charges and *Pegaso* picked up survivors, while *Procione* and *Orsa* looked for the submarine. In all, 116 depth charges were used, but only one pattern fell close to *P 33*, knocking out some lights. At 70ft Whiteway-Wilkinson lost trim and only regained control at 310ft. Several leaks developed and he headed back to Malta for repairs.

The larger submarines were devoted to carrying stores to Malta, but the minelayer *Cachalot* (Lieutenant H.R.B. Newton RN), departing Malta on 26 July en route to Egypt, had orders to intercept an escorted tanker (*Capo Orso*) off Benghazi. At sunset on 29 July the submarine surfaced to a calm sea, in clear visibility, but with patches of mist. Newton's intention, because of the submarine's large silhouette, was to avoid a night action. He expected to intercept his target at 0230hrs on 30 July and dive at dawn when 8 miles ahead in order to attack submerged. At 0155hrs, Newton was told a destroyer was very close and dived, but in doing so experienced problems with the boat's hydroplanes. In addition, due to an error the battery was almost depleted. At 0250hrs he surfaced to catch up, but due to the depleted battery intended to pursue for an hour.

At 0335hrs a lookout on *Cachalot* spotted a tanker. A 20-minute chase followed and to slow it down the deck gun opened up at 1,500yd. Newton made a failed diving attempt when *Generale Achille Papa* (Capitano di Corvetta Gino Rosica) was 300yd away. Rosica, Newton recalled, 'realizing that I was not diving … had gone full speed astern and finally rammed *Cachalot* … then remained 20 feet astern with all her main armament trained on *Cachalot*, whose own gun would not bear … The enemy opened fire with his entire anti-aircraft armament. Fortunately all shots went high, causing no casualties' (quoted in Evans 2010: 280). Newton decided to scuttle and all of *Cachalot*'s crew were brought aboard the Italian ship.

After a week in dock, on 6 August *P 33* departed to intercept – along with *P 32* and *Unique* – a convoy heading towards Tripoli. On 18 August, *P 32* sighted five merchant ships escorted by the destroyers *Freccia*, *Euro* and *Dardo*, and the torpedo boats *Procione*, *Pegaso* and *Giuseppe Sirtori*. *P 32* heard a depth-charge attack (probably on *P 33*) and made a failed attempted to contact the submarine. *P 33*, ordered 8 miles west of *Unique*, may have stumbled into the Tripoli minefield due to a navigation error. *P 32* was sunk later that day, after she surfaced into another section of the minefield by mistake. The Italians claim *P 33* was sunk on 18 August in the Gulf of Sirte by *Partenope*, escorting another convoy from Tripoli to Benghazi, but the submarine had no reason to be there as *P 33* was due to return to base.

In September, *P 34* arrived at Malta and in October, *P 31* and *Porpoise*. *Perseus*, *Trusty* and *Thrasher* were also present. On 27 September, *Upright* was successful north of the Strait of Messina. Lieutenant J.F. Michell, the torpedo officer, reported the appearance of a 'torpedo boat. She started circling us, obviously trying to pinpoint our position. She steamed past our bows the first time and Johnny [J.S. Wraith] started



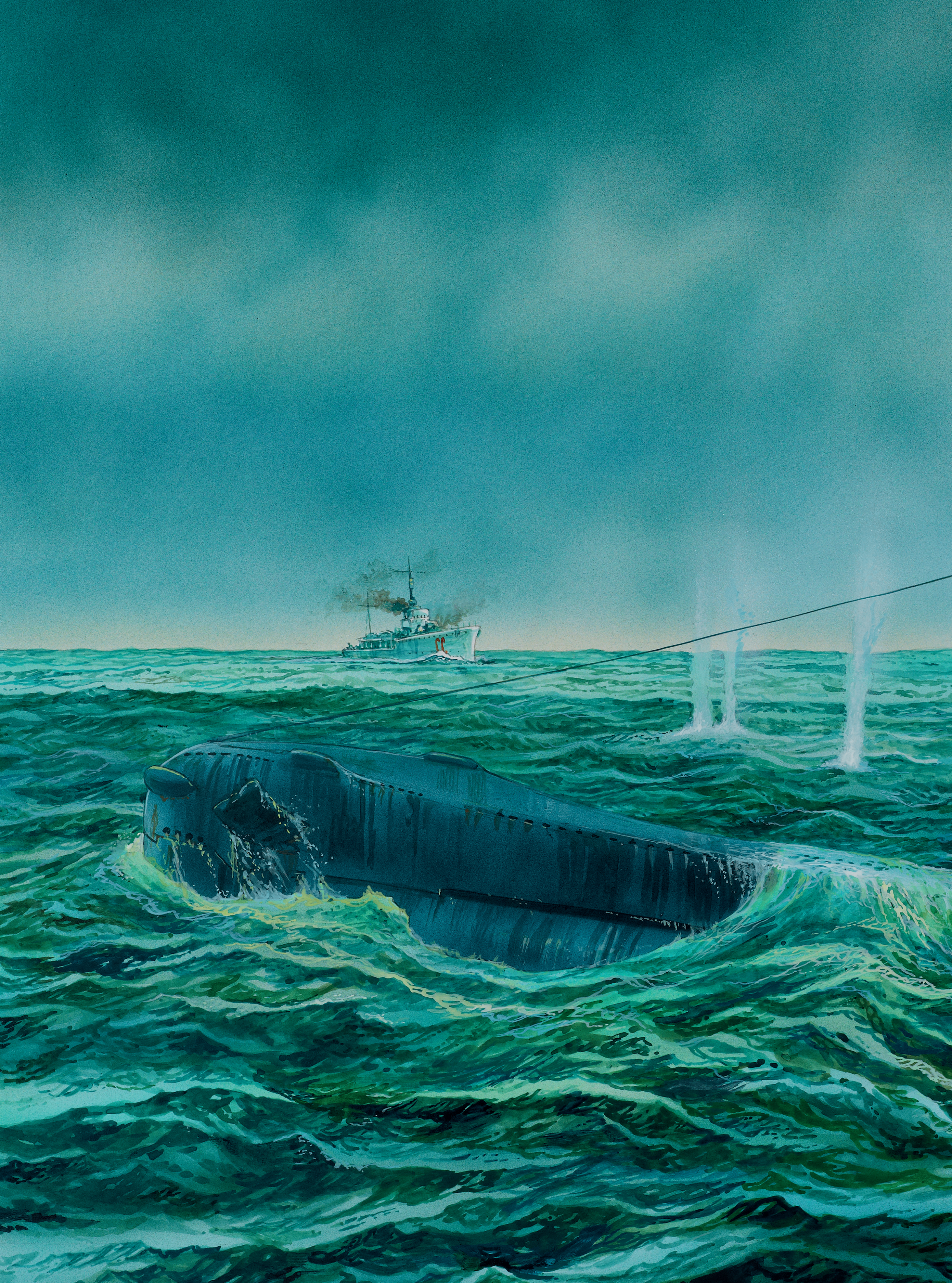
the attack. We got One and Two tubes ready. Without altering course, at Slow Group Down [i.e. low speed] he fired two torpedoes' when the ship went past again (quoted in Wingate 1991: 110). It was *Albatros*, heading to escort *U 371* through the Strait of Messina. At 0858hrs an explosion was heard; 35 of 83 crewmen (including two German officers) were lost. On 11 December 1941, *Truant* (Lieutenant Commander H.A.V. Haggard) also had some success when the Spica-class *Alcione* was sighted approaching Souda Bay, Crete, with the tankers *Arca* and *Ellis*. At 1320hrs Haggard missed *Arca* with four torpedoes at 3,500yd, but one torpedo hit *Alcione*, which eventually sank.

Rorqual was in the Far East before arriving at Malta in May 1940. On 19 October 1941, *Altair* (a Spica-class vessel), escorting a convoy, hit mines and sank while in tow the next day. On 20 October, another Spica-class vessel, *Aldebaran*, sank after hitting a mine. The mines were laid by *Rorqual* (Lieutenant L.W. Napier) on 8 October at 37°29'N, 23°53'E in a direction of 330 degrees for 2.7 miles at a depth of 8ft with a spacing of 300ft. *Rorqual* carried out many patrols around Italian shores, laid many more minefields, attacked targets with torpedoes, and carried supplies to Malta before departing for a refit in December 1942, which lasted until August 1944. (Cody Images)

JANUARY–JUNE 1942

In the first weeks of 1942 the Deutsches Afrikakorps launched an offensive that recaptured Benghazi in February. From February to May, 236,500 tons of supplies and 106,500 tons of fuel were transported. In June, Axis forces captured Tobruk and advanced deep into Egypt, threatening the Suez Canal. All of this occurred despite the Allies knowing the composition, sailing date and route of nearly every African convoy from late 1941 to December 1942 (until a new submarine cable between Sicily and Tunisia secured Axis communications) and German signals sent by their Enigma coding machines being read.

At the beginning of 1942 only British submarines could carry on the Allied maritime offensive, and from January to June 1942, while only 15 Axis merchant ships were sunk, 11 of those lost were sunk by submarines. Supermarina deemed submarines to be the most dangerous threat, but in March 1942 only seven Italian ships had sonar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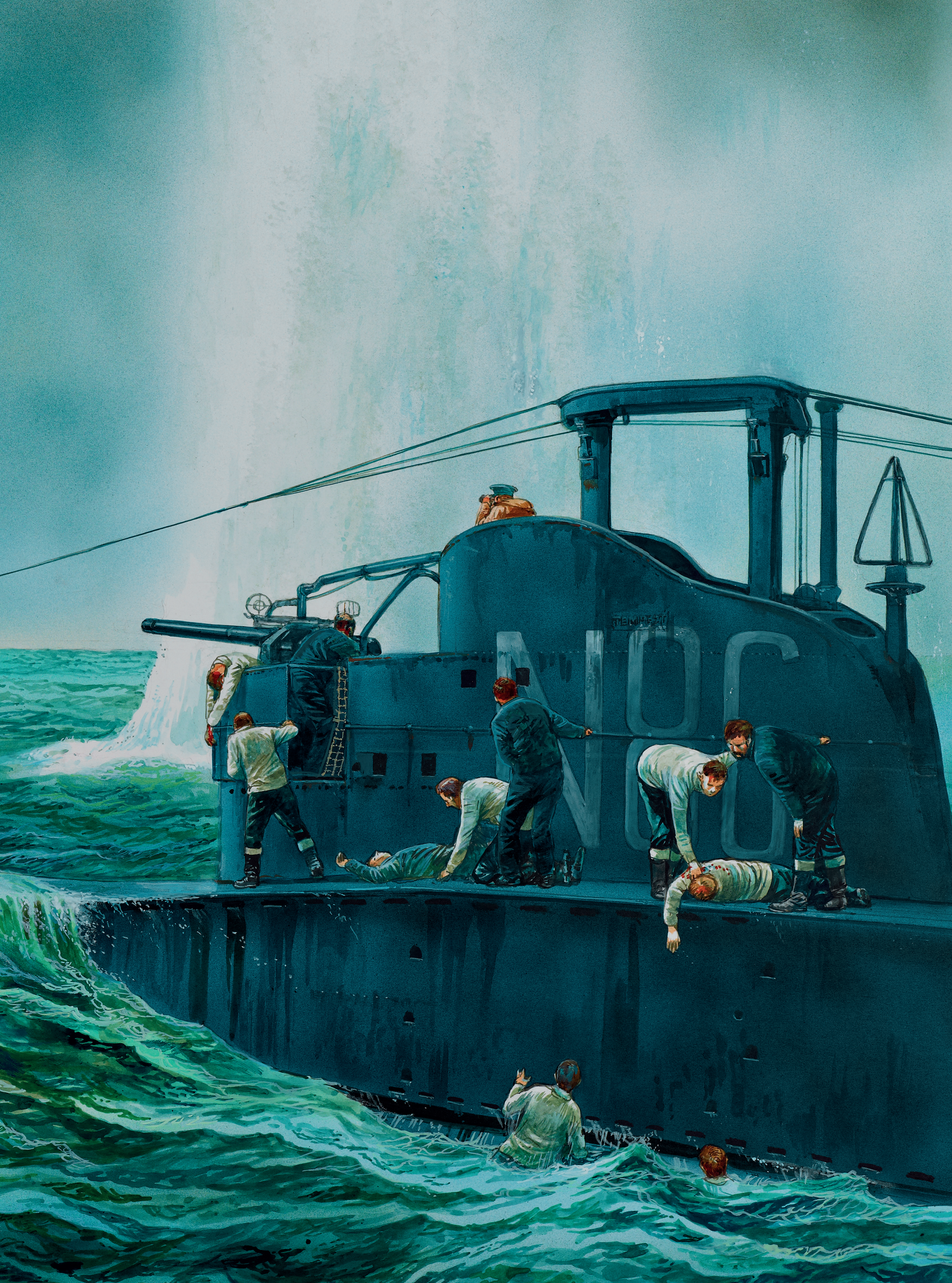

TEMPEST
N06

PREVIOUS PAGES The depth-charge attack on *Tempest* has caused salt water to get into the battery compartment, which when mixed with sulphuric acid from broken batteries produced chlorine gas. The time is 0945hrs and Lieutenant Commander W. Cavaye, waiting for *Circe* to make an attack run without dropping charges, has surfaced. Two ratings are near the deck gun. *Circe* has already turned to make another attack and, about 800yd away, is just about to open up on *Tempest* with the main deck gun. According to Anscomb, who was on *Tempest*, *Circe*'s crew must have thought they were 'firing on the men whom they thought had sunk their hospital ship' (Anscomb 1957: 127). He described how 'Visibility was good, but the sea had got up since I had last seen it the previous night' (Anscomb 1957: 127). Palmas reported that 'Englishmen were throwing themselves into the sea … I do not order to fire until 0949 when I discover that two men are getting close to the gun. The machine guns get into action immediately and they hit the turret. I also shoot 9 shots with the 100mm gun … at 0951 the men move away and I suspend fire' (quoted in Rauber 1978: 197). He added that 'The behaviour of the prisoners was calm and dignified, only one in the sea had shouted desperately when the torpedo boat approached to rescue. All were given refreshments and covering. Nothing of importance was reported, except the hint to the effect of the first attack. They also referred to the violence of the last depth-charge attack, but not the precise damage' (quoted in Evans 2010: 298). Anscomb would write 'The Italians treated us well, and the sailors gave us some hot vino and biscuits … and a change of clothes' (Anscomb 1957: 129).

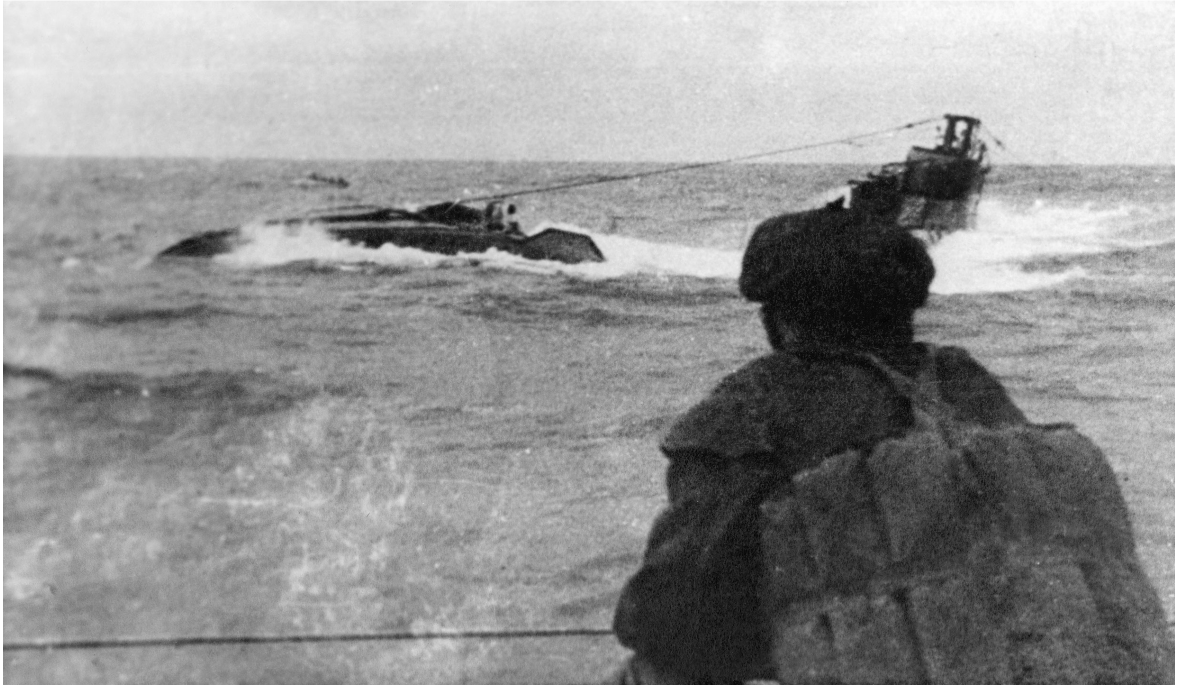
to detect them. In January, *Una*, *P 35*, *P 36* and *P 38* arrived at Malta; in February, *Tempest* arrived. On 10 February, *Tempest* sailed to join *Una* and *Upright* across the Gulf of Taranto.

On the afternoon of 12 February, the tanker *Luciana* was sunk by *Una* (Lieutenant D. Martin) despite being given safe passage to refuel a repatriation ship. *Lince* then sailed out to find the submarine responsible. *Circe* (Capitano di Corvetta Stefanino Palmas), heading to the Gulf of Taranto, was also ordered to carry out an ASW sweep between 39°10'N and 39°30'N and 17°40'E and 18°00'E. At the southern end of this area was *Tempest*. Some 45 minutes prior to *Una*'s attack, Lieutenant Commander W. Cavaye, *Tempest*'s captain, had broken off his attack on *Luciana*, recognizing the ship as a prohibitive target. He received a signal that night warning him the Italians were aware a submarine was in the area, but remained where he was and charged batteries. He closed with the tanker and observed searchlights. At 2315hrs the tanker sank.

Circe entered the area shortly after midnight, reduced speed to 14kn and began an ECG search while zigzagging. At 0315hrs on 13 February, when *Tempest* dived (unobserved from *Circe*), *Circe*'s hydrophone operator heard the submarine's klaxon and at 0332hrs depth charges were launched. The rough sea hampered the effort to bring more depth charges up on deck, so Palmas launched marker buoys to show the submarine's position. At 0630hrs the day dawned with thick cloud. As Palmas did not use any more depth charges, by 0700hrs Anscomb was 'beginning to have hopes that they had really lost us when we heard engines very close overhead once more' (Anscomb 1957: 122).

At 0716hrs Palmas attacked. Anscomb described another 'series of shattering explosions … Dazed and shaken and scared we hung on … We were at the mercy of that destroyer. At regular intervals we heard her rumble over us. We could hear her Asdic "pinging" us … like an invisible whiplash, but never knew exactly where she was' (Anscomb 1957: 122). The mains shorted onto the pressure hull, blowing the main fuses and putting the ballast pumps out of action; the main ballast tanks stabilized the submarine at 500ft 'either by venting the air into them, or blowing water out by means of compressed air', which was 'very noisy at a time when silence was vital to give us any chance of surviving at all'; the submarine rose again, but 'the sudden extra noise was playing right into the hands of our attacker' (Anscomb 1957: 123). Depth charges burst all around and 'we sat and shook in the semi-darkness, with only the secondary lighting flickering palely … and things breaking loose and crashing about us'; *Tempest* was 'withstanding a pounding that would have completely shattered a less well-found ship' (Anscomb 1957: 123). At 0726hrs Palmas observed air bubbles followed by an oil slick, which made him think the submarine was 'severely damaged and will therefore soon be forced to surface. I signal to Taranto that I have only one pattern of depth charges remaining' (quoted in Wingate 1991: 146).

On *Tempest* 'miraculously, unbelievably, there was a definite lull' (Anscomb 1957: 124). A bucket was kicked accidentally, prompting Cavaye to say that 'I'll have that man shot!', and the attack began again. Palmas reported how 'At 0917 I start my final attack. Running in at 0942 on a course of 090 degrees at 1,000 metres [1,100yd], I sight two enormous air bubbles. Three minutes later, the submarine surfaces on my port quarters' (quoted in Wingate 1991: 146). *Tempest*'s gunlayer, Hugh Pritchard,

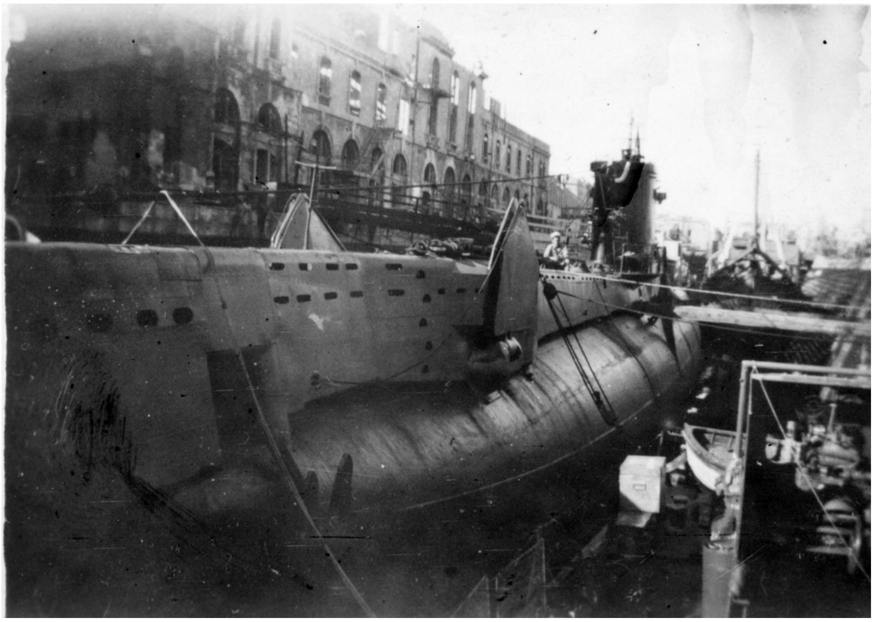


Here, *Tempest* is viewed from *Circe* on 13 February 1942. Able Seaman Bob Appleton recalled how the gunlayer, Hugh Pritchard, with George Milward behind him, stood on the gun hatch ladder ready to open the gun hatch. Cavaye shouted out 'Abandon ship!', but Pritchard 'opened the hatch and water poured down into the boat. I was knocked off my feet'. He observed that Pritchard, 'whilst calling for ammo, started to train TEMPEST's gun on the enemy ship'; *Circe* opened fire 'More in self defence I guess. One of the first to be hit was Pritchard, who was killed outright' (quoted in www.hansconclan.co.uk). (© IWM HU 2278 B)

plus Cavaye and Sub-Lieutenant M. Neel-Wall, the gunnery officer, were killed by *Circe*'s gunfire. *Circe* lowered a boat to pick up survivors, but carried on, afraid of an attack from another submarine, before turning back to retrieve prisoners. Anscomb was in the water for 2 hours. After 24 crewmen were rescued, Palmas fired 12 rounds at the submarine, but she would not sink. At 1430hrs, because sea conditions were better, three men jumped onto the starboard bow hydroplane and a tug attempted a tow at 1605hrs, but the submarine sank by the stern soon after.

Palmas reported that the ECG worked very well despite the sea conditions and praised the ECG operator, who 'carried out his task at the ECG for 7.5hrs with exceptional competence, sense of duty, and highly commendable spirit of sacrifice' (quoted in Rauber 1978: 199). The depth-charge crew had a difficult time, but despite the sea state they managed to carry out replenishment by rolling the bombs on deck. A total of 45 charges were used: 16 WBD and 29 WBF. Palmas's superiors criticized him for not attacking earlier and placing too much reliance on the ECG operator. They said that *Lince* should have joined *Circe* – despite its ECG not working, *Lince* could have carried out bombing following *Circe*'s signals. Instead, the ship was ordered to Crotone at 0730hrs.

Circe was soon in action again. On 20 February, three merchantmen escorted by *Antonio Pigafetta*, *Emanuele Pessagno*, *Antoniotto Usodimare*, *Maestrale* and *Scirocco* (all destroyers) and *Circe*, of which only *Circe* had ECG, departed Taranto for Tripoli. *P 38* (Lieutenant R. Hemingway), *Una* and *P 39* sailed to intercept. *Una* attacked, but failed to score a hit on the morning of 23 February. Palmas called for enhanced vigilance from the ECG operator. At 1014hrs, north-west of Cape Misrata, an echo 1,630yd off the starboard bow was reported. Palmas described how *Circe* turned 'into the bearing, increases speed to 18–20 knots and moves across the target. At around 1,000m [1,100yd]



Uproar deployed to Malta in October 1941 as *P 31*. On 5 March 1942, after *P 31* sank the merchant ship *Marin Sanudo* near Lampedusa, *Cigno* (Spica class) and *Procione* (Orsa class) counter-attacked with 22 and 12 depth charges, respectively. Four were very close and forced the submarine to the seabed at 240ft. Lieutenant J. Kershaw decided to remain there and not move because the ships were clearly audible, stopping and starting their engines. After 2¼ hours they departed. A refit of the submarine was carried out during September–December 1942 at Chatham (as shown here) before a return to Malta in March 1943 as *Ullswater*. In total, the submarine completed 16 patrols in the Mediterranean before the Armistice. (Lorna Edwards)

the periscope is sighted at the position of the echo. With 16 knots moved onto it and dropped six depth charges from rails and four from throwers into the location of the dive indicated by air bubbles. Depth setting 70 metres [230ft]' (quoted in rommelsriposte.com). After the explosions, Palmas stated 'the submarine is blown to the surface on my port quarter … No one leaves the submarine. I alter to starboard to close, but meanwhile *Antoniotto Usodimare* has opened fire with her main armament and machine guns. Some of her rounds are "over", so I am forced to alter course abruptly' (quoted in Wingate 1991: 150). An Italian rating was killed by friendly machine-gun fire.

Depth charges, exploding under *P 38*, had forced the submarine momentarily to the surface. *Circe* called off the other ships and *P 38* submerged; Palmas reported 'the air escort machine-gunning the submarine and, as she begins to dive again, a second aircraft drops bombs' (quoted in Wingate 1991: 150). *Emanuele Pessagno* and *Antoniotto Usodimare* both began dropping depth charges. Palmas could not obtain a bearing and asked the other ships to withdraw. Then, suddenly, 'the submarine breaks surface on Red 150 degrees [30 degrees off the port quarter]. Her bows rear into the air; she is leaping and diving; a few minutes later she is at a 40 degrees bow-down angle, with her propellers turning in the air and her after hydroplanes at hard-a-rise. She had made her last effort to reach the surface' (quoted in Wingate 1991: 150). At 1050hrs wreckage was observed. Palmas honoured those lost by having all the crew on combat stations as he moved over the site. He thought the immediate response and simultaneous launching of depth charges were successful, and recommended that two ECG-equipped ships should be available to guard a convoy – 'one used for attack and the other to continue to protect the convoy' – and that 'other ships and aircraft should not intervene' (quoted in Rauber 1978: 200).

In March, *Upright* and *Unique* sailed for home. On 12 April, *Upholder* was ordered to join *Thrasher* and *Urge* to intercept a convoy north of Tripoli at 33°N 14°E sailing from Taranto. *Upholder* never got there. On 14 April, two Bf 110s of 8./ZG 26 and two Do 17s of 10./ZG 26 detected a submarine approaching the convoy at 34°47'N, 15°55'E, further north and east of Tripoli from where *Upholder* had been ordered to intercept the convoy. They dropped a smoke marker, attacked and soon spotted leaking oil. The submarine might have sustained enough damage to stop her from surfacing, but not enough to sink her and cause wreckage.

Pegaso (Capitano di Corvetta Francesco Acton), recently fitted with ECG, was escorting the convoy and at 1615hrs, Acton reported that because of the smoke 'and distant reading on echo-direction finder, I carry out the prescribed alarm signals for the submarine and begin the attack by dropping a pattern of depth charges'; at 1630hrs, he reported 'Receiving no further echo on echo-direction finding, I call off the attack and rejoin the convoy' (quoted in Wingate 1991: 176). *Pegaso* may have finished off the submarine. *Upholder* was supposed to be 100 miles away, but may have altered position to intercept the convoy more directly. Alternatively, *Upholder* may have hit a mine some time earlier.

In June, *Unison*, *United*, *Unruffled* and *Utmost* arrived at Malta. By this time, the Axis offensive had recaptured Benghazi and Tobruk, which meant Axis convoys were more dispersed. ULTRA proved more important than ever in detecting them.

JULY–DECEMBER 1942

The Axis forces needed 50 per cent more supplies per month due to their offensive. On 2 July 1942, the Axis advance paused; Generalfeldmarschall Albert Kesselring, Oberbefehlshaber Süd (the overall German commander in the Mediterranean), and Generalfeldmarschall Erwin Rommel, from August 1942 commander of Panzergruppe Afrika, agreed that 5,700 tons of supplies and 295 vehicles were required to continue. The details were intercepted and British submarines were sent out to intercept the merchant ships. Despite this, 70 per cent of Axis supplies arrived, but the ground offensive was defeated at Alam el Halfa on 2 September. In October, a well-prepared Allied offensive at El Alamein began to drive the Axis forces out of Libya and an Allied invasion of Morocco and Algeria threatened Tunisia. Benghazi was recaptured on 13 November and Tobruk on 20 November; even so, the Axis forces defended Tunisia and that month transported 695 tanks there. If properly escorted, the numbers of surviving Axis merchantmen over 500 GRT were more than enough to resupply the Axis forces, and Italian service chiefs planned for a war into 1944.

At 1300hrs on 2 July *Monviso*, *Nino Bixio* and *Ankara*, escorted by three destroyers and five torpedo boats, departed Taranto for Libya. At 1418hrs, ULTRA detected the departure and reported the route and timings, and at 2040hrs SIS Section B intercepted a message to a British reconnaissance aircraft ordering a change of course to search for the convoy. RDF pinpointed the aircraft and the convoy was ordered to change course, but was still detected at 0330hrs. Again, a course change followed and no attacks by aircraft occurred. During the day, at 1030hrs and 1415hrs, attacks by *Turbulent* were made. *Pegaso* detected the submarine and drove it off. The convoy reached Benghazi with 439 vehicles and over 9,000 tons of munitions, oil and other matériel the next day.

At Malta only *Urge*, *Una*, *P 31*, *P 34* and *P 35* survived and the submariners were evacuated. *Urge* was sunk during the journey by Italian aircraft. The remaining submarines were in repair and maintenance at Port Said in Egypt before moving to Haifa in British Palestine with the 1st Submarine Flotilla. This was a temporary setback. By the beginning of August, *P 34*, *P 31*, *Una* and *P 35* were back at Malta. *P 42*, *P 43* and *P 44* also arrived. Returning from refit, *Utmost* would join them, as would *P 211*, *P 46* and *P 37* in September, and *P 212* and *P 247* in October.

On 12 August, *Porpoise* (Lieutenant L. Bennington) was laying mines (which sank the *Generale Antonio Cantore* on 22 August) and, after receiving a signal, attacked and torpedoed the steamer *Ogaden* making for Tobruk at Ras el Tin; another torpedo went underneath the escort, *Generale Carlo Montanari*. There was no time for an SIS warning. Then, on 15 August, ULTRA advised Cairo of another convoy – *Lerici* and *Ravello*, escorted by two destroyers and two torpedo boats (*Calliope* and *Castore*). Supermarina warned the convoy commander that he had been detected by aircraft, but he could not avoid *Porpoise* and *Lerici* was duly sunk. The escorts counter-attacked using ECG and 60 depth charges, but no appreciable damage was done. On 19 August, in the pre-dawn with no moon and a rough sea, *Porpoise* observed *Lince* approaching the submarine 3,500yd away, having been diverted from escort duty to intercept the submarine. On 14 August, *Lince* had departed Souda escorting the tanker *Stige* to Benghazi, and that day a German aircraft signalled the presence of a submarine off Capo Spada; as there was some ECG contact, the aircraft launched depth charges, and thought that damage had been done because oil was observed (it was actually the carbon residue of explosives).

On *Porpoise*, silent routine was adopted at 80ft and the course was altered. *Lince* passed overhead and launched nine depth charges which, according to Blamey, 'caused an unholy commotion, as they were very close and shook the boat from stern to stern'. Bennington altered course again, which, on one motor, was 'a slow business' and 'we had not moved very far from our diving position when a further pattern of charges fell around us' (Blamey 2002: 159). During two more runs another nine each were launched. The ECG on *Lince* showed the submarine still moving, but because of the attack on 14 August there were no more depth charges on board. *Lince*'s captain thought he had caused extensive damages because he launched charges where the submarine submerged quickly enough that it could not be more than 35ft away; 12 attack runs were then made in 30 minutes, with depth charges used only on those runs with the best ECG indications.

The crew on *Porpoise* could predict an attack because *Lince*'s propellers were audible. Evasive action was slow at this speed, 'there being little response to either the rudder or the hydroplanes', but at least 'the enemy would be unable to hear until the noise from these charges subsided' (Blamey 2002: 160). Oil and high-pressure air leaks were attended to, 'a difficult task in itself, as it involved using large heavy spanners in very restricted spaces, some almost inaccessible' (Blamey 2002: 159). The batteries were damaged and needed to be removed from the circuit by using cutting-out leads. Acid was escaping and supplies of a strong alkali carried to neutralize it were running out. At 1030hrs, according to Blamey, Bennington ordered periscope depth prior to surfacing. The periscopes were both damaged, however, and the sound detector was out of action. A metal rod, placed against the hull to pick up sound half a mile away,

Here, Lieutenant J.H. Bromage, captain of *Sahib*, and his crew are inspected at Algiers in 1943 by Rear Admiral C.B. Barry, Rear Admiral Submarines. Bromage arrived in Malta on 9 October 1942 and on 14 November tragically sank the Italian transport *Scillan* which was carrying British POWs – only 25 of 830 on board were rescued. On 14 December, 30 miles north-north-west of Cap Bon, he sank two merchant ships carrying munitions; the escorts *Ardito* and *Fortunale* counter-attacked. *Fortunale* obtained good ECG indications and made four runs (*Ardito*'s sonar was not working), using 26 depth charges, but none was close. After arriving at Gibraltar, *Sahib* completed eight patrols before departing on her final outing in April 1943. (© IWM A 16035)

heard nothing. Bennington had to surface because of the damaged batteries, a third of which were broken. *Lince*, with no more depth charges, had disappeared. The submarine was 700 miles from home and a destroyer escort was sent out. *Porpoise* made it back safely, arriving at Port Said on 21 August.

In October the U-class boats were ordered to prevent interference with the Allied landings in North Africa. *Una* and *Utmost* patrolled south of Messina, off southern Calabria; *P 37*, *P 35*, *P 43*, *P 211*, *P 212* and *P 247* were north of the Strait of Messina, and *P 46* and *P 44* were north of Sicily with the S-class boats from Gibraltar. On 19 October, the main Axis supply route was switched to Palermo round Cape San Vito to Bizerte. Submarines had to enter a channel of sea 100 miles long and 20 miles wide, with mines preventing exit to the north-west or south-east: 'This was a natural development but a highly dangerous one for the attacking submarines' (Simpson 2010: 268). Simpson thought 'Our predicament on this vital last supply route was a desperate business' (Simpson 2010: 272). For Mars, his patrol in November was 'the worst we had endured' because he was 'chased backwards and forwards across the ocean with maddening constancy, and without an iota of success' (Mars 2008: 182–83).

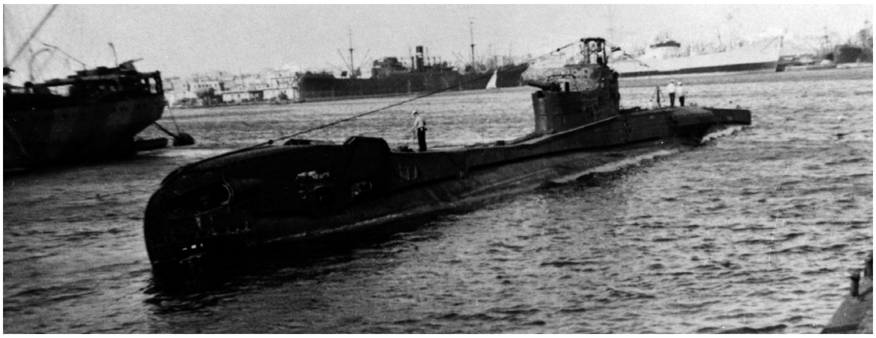
Utmost (Lieutenant J. Coombe) was the first submarine to operate in this channel. On 23 November, 3 miles north of Bizerte, Coombe with three torpedoes attacked the auxiliary minelayer *Barletta* accompanied by the Ciclone-class *Groppo*. *Barletta* was not hit and continued on while *Groppo* made a 20-hour ECG search that may have driven *Utmost* north. Coombe reported an intended arrival at Malta for 25 November, but his message was intercepted by Italian radio-finding. On that day, *Groppo* was escorting another convoy south around Marettimo Island when the captain, Capitano di Corvetta Beniamino Farina, observed an aircraft drop a bomb 4,000m (4,375yd) away, warning that a submarine was sighted. *Groppo* established ECG contact and attacked. Two hours later the aircraft dropped another bomb to signal the submarine's position. Farina thought he observed the wake of a torpedo (*Utmost* had none), and

Here is *Ardente*, a Ciclone-class torpedo boat launched in May 1942. Following training in the Tyrrhenian Sea in September–November, *Ardente* was deployed to Messina in Sicily and primarily escorted convoys to Bizerte in Tunisia from Sicily and also Napoli. On 11 January 1943, along with *Ardito* and *Clio*, *Ardente* was escorting a convoy to Bizerte and was attacked by a torpedo launched by *Umbra*, which missed. The following day, in poor weather and at night while returning to Sicily, *Ardente* collided with the Italian destroyer *Grecale* and a boiler exploded, causing the ship to sink. Only 44 of a crew of 177 were rescued. (Cody Images)

again attacked with depth charges. He signalled a success, though no results were observed and his superiors were not convinced. Coombe may have gone to Marettimo Island to avoid a minefield, and approached *Groppo*'s convoy simply to observe, but *Utmost* was probably lost due to mines; even so, according Lieutenant Tom Lancaster, as a precaution *Una* received a warning to 'alter course while transmitting by radio' (quoted in Wingate 1991: 246).

In mid-November, the 8th Submarine Flotilla moved to Algiers and assumed responsibility for Cap Bon. *P 222* (Lieutenant A. MacKenzie), an S-class boat stationed at Gibraltar since June, was ordered to head to Algiers via a patrol off Napoli. At 1300hrs on 12 December, *Fortunale* – under the temporary command of Tenente di Vascello Edoardo Manacorda – with *Ardito*, sailed from Napoli to Trapani, escorting two merchantmen. At 1522hrs, a signal warned that a submarine was 3 miles west of Capri. At 1734hrs, *Fortunale*, 6 miles south of Punta Campanella, sighted a submarine 3,500yd ahead and attacked, while *Ardito* protected the merchant ships. ECG was established and four attacks were made (with 31 depth charges), before contact was lost. MacKenzie wanted to intercept east of the island after dusk, but upon surfacing was silhouetted. No wreckage was seen as night descended. *Ardito* was also involved alongside *Ardente* in the sinking of *P 48* on 25 December.

On 6 March 1943, *Turbulent* (Commander J. Linton) was off Napoli; five torpedo boats (*Ardito*, *Groppo*, *Orione*, *Cigno* and *Generale Antonino Cascino*) departed harbour with three merchantmen. At 0745hrs, 34 miles from Punta Licosia, Capitano di Corvetta Silvio Cavo noted how a 'JU88 dropped a bomb about 3,000 metres [3,300yd] from my ship. I immediately moved to attack, whilst the convoy turned to port … At 1,300 metres [1,430yd] I picked up an echo off the bow. I then approached and launched the first carpet of depth-charges. I turned about and made for the point where I had launched the buoy. The ECG picked up an echo at 1,000 metres [1,100yd] and I set course to launch a second carpet. I was on position and about to launch when the ship suddenly reduced speed owing to loss of steam pressure' (quoted in Rauber 1978: 281). For safety, no depth charges were launched, and contact was lost at 0935hrs. The following day an aircraft indicated the presence of a submarine, but the destroyer *Lampo*'s ECG was not functioning. Linton then proceeded to the east coasts of Corsica and Sardinia, where his submarine was probably mined. (Cody Images)



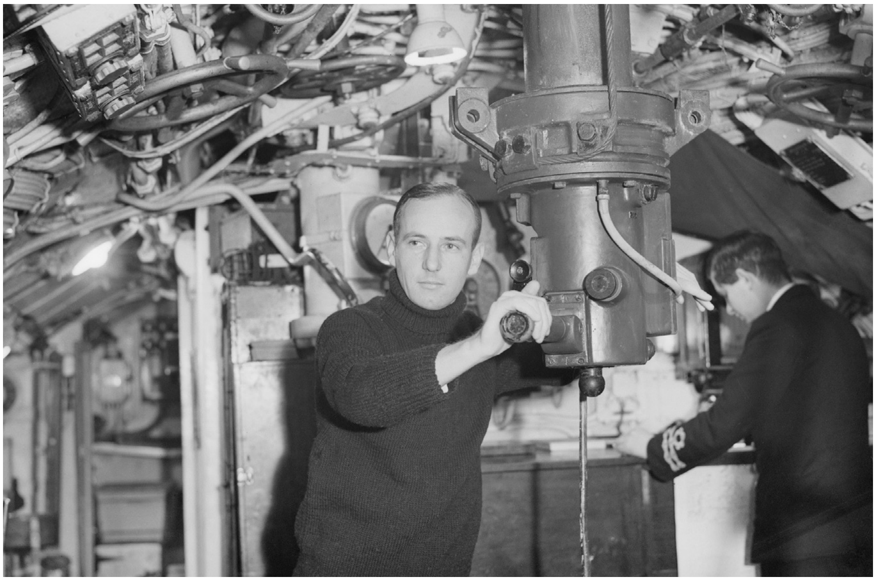
JANUARY–APRIL 1943

The convoy battle entered a new intense, final phase. A total of 4,226 mines were laid by the Allies, forcing Axis shipping into a narrow channel. Captain Simpson, commanding the 10th Submarine Flotilla on Malta, was worried 'every day and night over how my men were standing up to the strain of operating within a narrow channel with barely sea room to manoeuvre. Ceaseless enemy air patrols overhead and convoys to attack which now contained invariably twice the escorts than there were targets. The loss of four submarines in five weeks, and no prospects of change' (quoted in Wingate 1991: 272).

In March 1943, Italy had 64 sonar-equipped ships, but only 32 torpedo boats and destroyers were serviceable. Tunisia needed ten supply ships every three days; in the last three weeks of March, however, ten merchantmen were sunk (five to submarines and five to aircraft), as well as 31 in port by aircraft (there were now 4,900 Allied aircraft in theatre to fight 1,500 Axis aircraft). Axis losses were unsustainable, reaching on average 2.5 ships per day, and by late April only four operational escorts were available.

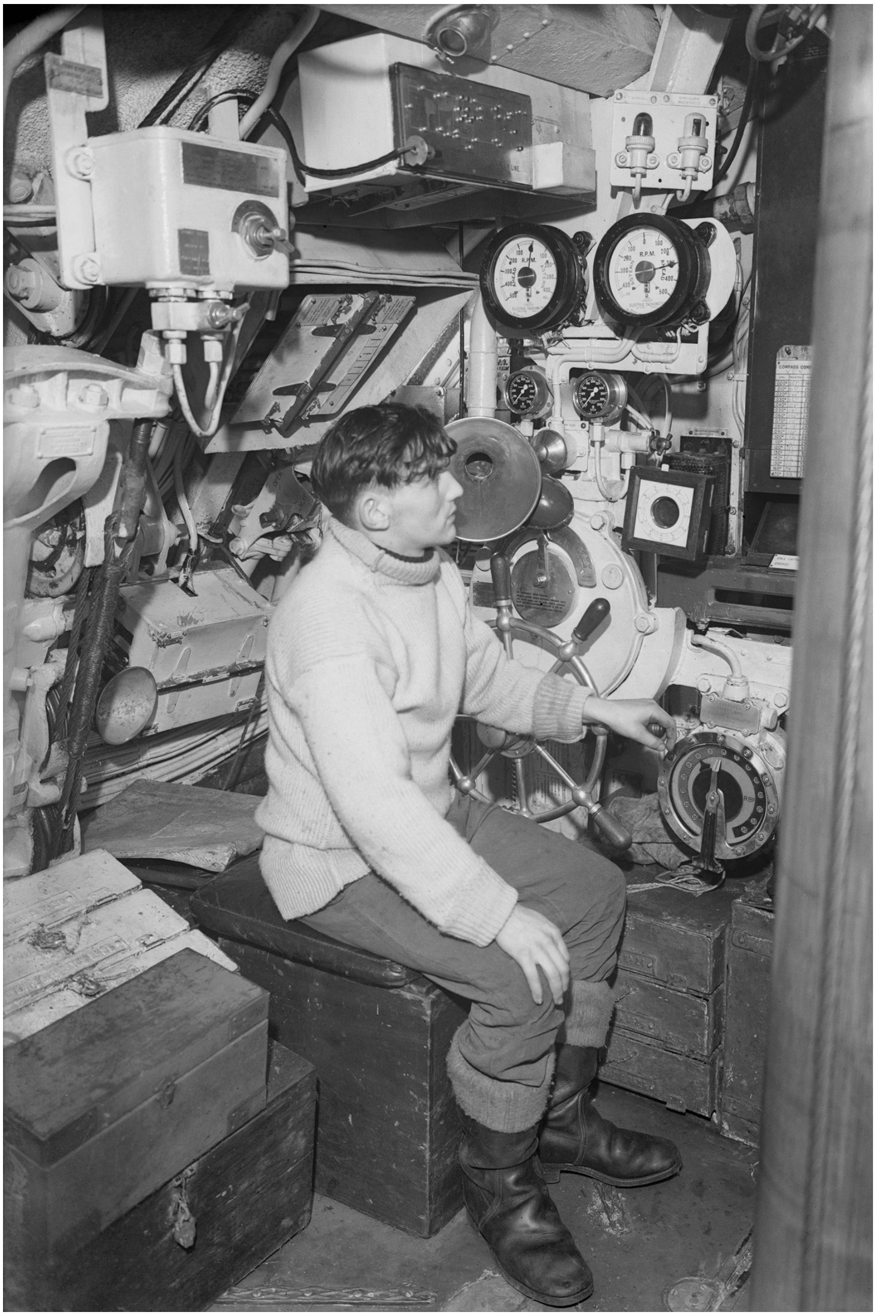
In April 1943 the 8th Submarine Flotilla had five T-class and seven S-class submarines, including *Sahib* (Lieutenant J.H. Bromage), off Capo di Milazzo, Sicily. At 0450hrs on 24 April, *Sahib* dived on observing an approaching convoy – the merchantman *Galiola* with *Gabbiano* and *Euterpe* off either bow, and *Climene* and *Angelo Bassini* off the starboard and port quarters, respectively. Bromage reported:

> At 0458 four torpedoes were fired [at *Galiola*], aimed individually and spread two-thirds of a ship's length apart on an estimated 100° track with range of 2,800 yards, *Sahib* then being about 700 yards 15° on the starboard bow of the *Climene*. After firing, *Sahib* nearly broke surface and the swirl of the propellers was observed by aircraft after the torpedo had hit the target. One bomb was dropped which did no damage but which indicated our position to *Climene*. She immediately obtained A/S contact. (Quoted in Evans 2010: 352)

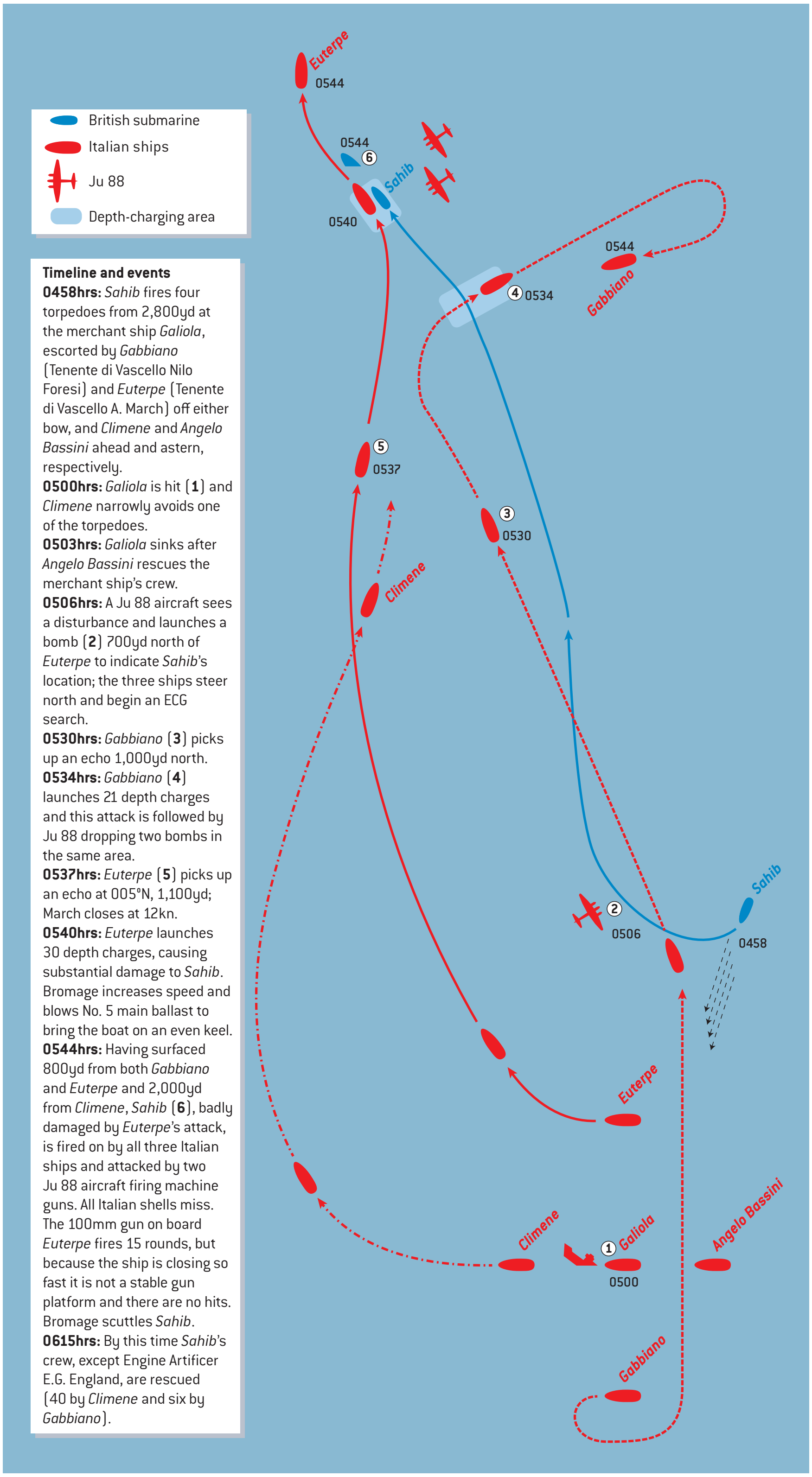


At 2210hrs on 12 March 1943, north of Cape San Vito, *Thunderbolt* (Lieutenant Commander C. Crouch – pictured here aboard *Thunderbolt*) torpedoed the merchantman *Esterel*, escorted by *Orione* and *Persefone*. *Libra* (Capitano di Corvetta Gustavo Lovatelli) was ordered to hunt for the submarine and had a good ECG contact at 1,200yd for two hours, during which time seven attacks were made. Debris suggested the submarine was damaged. Then, at 1345hrs on 13 March, *Cicogna* (Tenente di Vascello Augusto Migliorini), a Gabbiano-class vessel, sailed from Trapani to continue the search. At 0516hrs on 14 March an ECG contact was obtained. At 0734hrs a periscope was observed 2,000yd off the port bow, but Migliorini did not attack, hoping to convince the submarine he had no depth charges. He was then surprised to see the submarine's periscope just 7ft from the ship; he ordered a release of 24 depth charges and increased speed. A huge explosion momentarily lifted the submarine's stern out of the sea perpendicular to the surface. Air bubbles and oil surfaced and whitish smoke, which Migliorini believed was chlorine gas, appeared at the site of the sinking. (© IWM A 8461)

Here is the helmsman on an S-class boat. During the action of 24 April 1943, Leading Seaman Braird, *Sahib*'s helmsman, was on the casing when he observed an Italian warship firing her forward guns: 'a pillar of smoke and water shot up about a hundred yards off … a second shell landed in almost the same spot. Most of *Sahib's* crew were now crowded on the casing … A Ju88 had wheeled and then banked along our starboard side in preparation for an attack'; the aircraft grew in size and 'tracers appeared to move leisurely towards us. One that went past my head at less than a foot … tingled for more than a minute'. He jumped into the sea, which 'was surprisingly warm. I struck out vigorously to put a few yards between myself and our stricken submarine' (quoted in Evans 2010: 356). (© IWM A 22329)



Leading Seaman Braird, with the diving gauge oscillating from 24ft to 26ft, realized 'At that depth I knew that all our periscope standards, and perhaps part of the conning tower, would be plainly visible to the enemy'; with 'the wheel pressed over', the submarine eventually 'reached a hundred feet and had begun to level out', but with *Gabbiano*, *Euterpe* and *Climene* approaching (*Angelo Bassini* was rescuing survivors) the crew 'were all very much aware of the relentless BEEP … BEEP … BEEP of the enemy's asdic' (quoted in Evans 2010: 353).



Timeline and events

0458hrs: *Sahib* fires four torpedoes from 2,800yd at the merchant ship *Galiola*, escorted by *Gabbiano* (Tenente di Vascello Nilo Foresi) and *Euterpe* (Tenente di Vascello A. March) off either bow, and *Climene* and *Angelo Bassini* ahead and astern, respectively.

0500hrs: *Galiola* is hit (**1**) and *Climene* narrowly avoids one of the torpedoes.

0503hrs: *Galiola* sinks after *Angelo Bassini* rescues the merchant ship's crew.

0506hrs: A Ju 88 aircraft sees a disturbance and launches a bomb (**2**) 700yd north of *Euterpe* to indicate *Sahib*'s location; the three ships steer north and begin an ECG search.

0530hrs: *Gabbiano* (**3**) picks up an echo 1,000yd north.

0534hrs: *Gabbiano* (**4**) launches 21 depth charges and this attack is followed by Ju 88 dropping two bombs in the same area.

0537hrs: *Euterpe* (**5**) picks up an echo at 005°N, 1,100yd; March closes at 12kn.

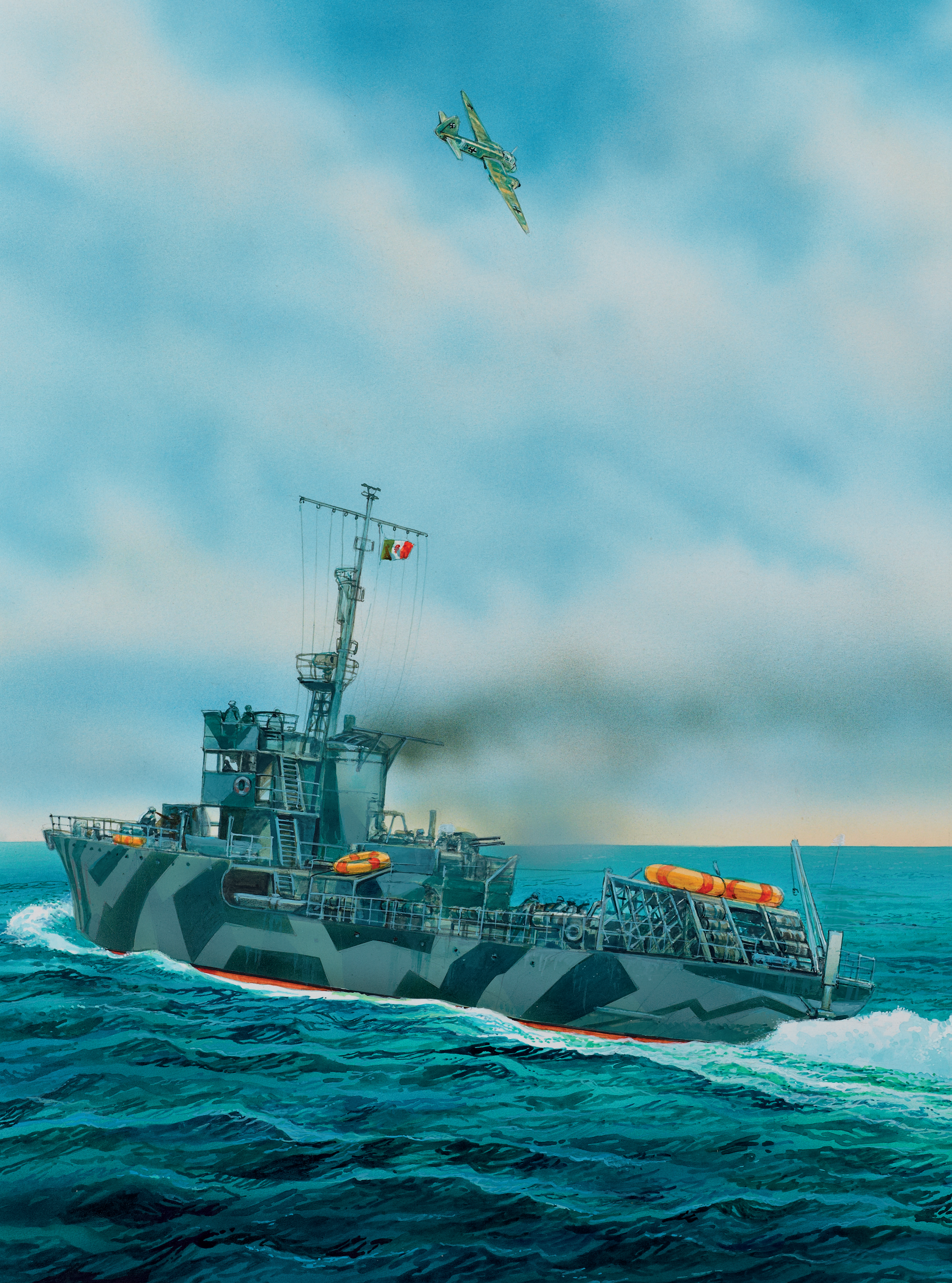
0540hrs: *Euterpe* launches 30 depth charges, causing substantial damage to *Sahib*. Bromage increases speed and blows No. 5 main ballast to bring the boat on an even keel.

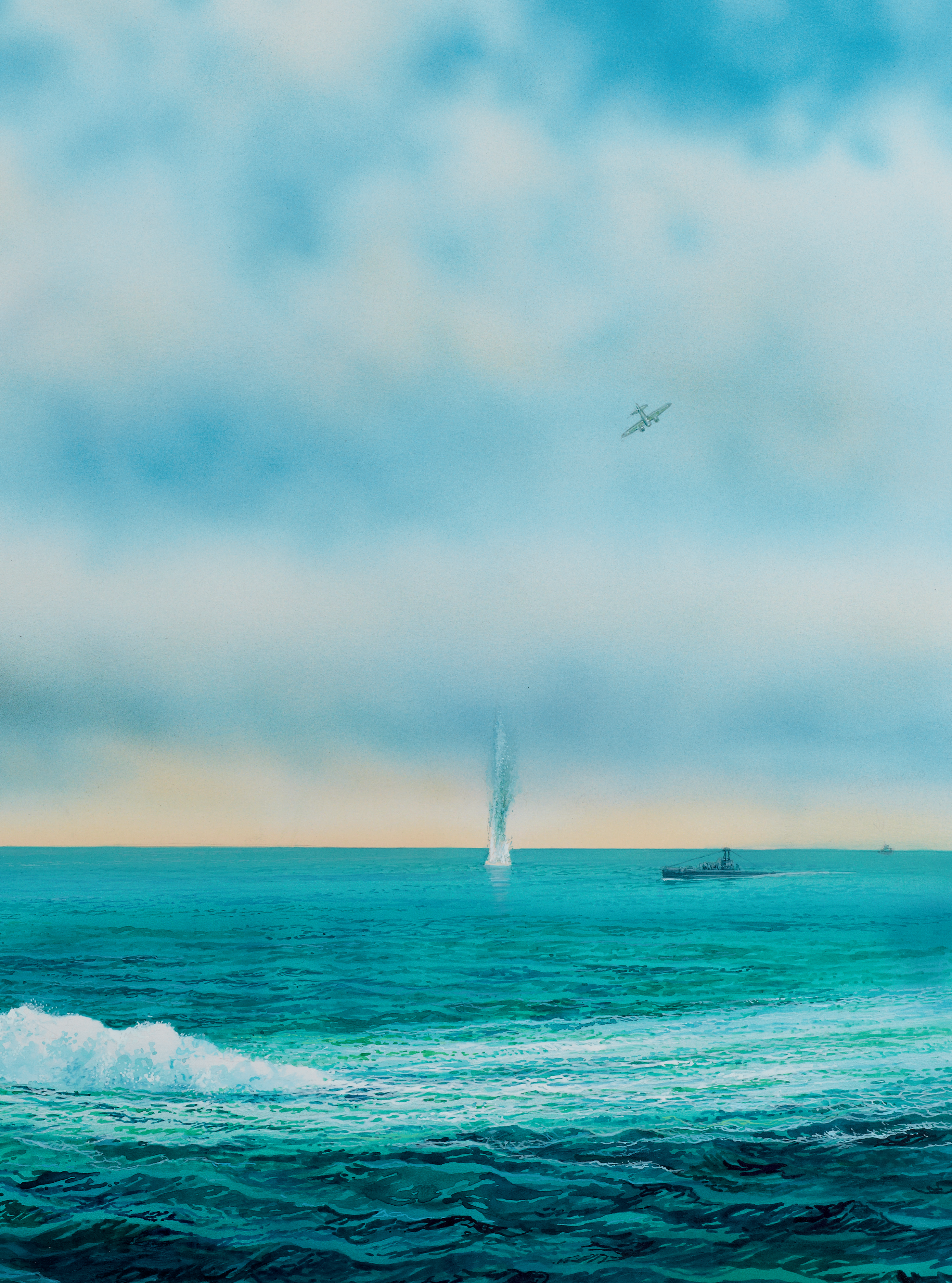
0544hrs: Having surfaced 800yd from both *Gabbiano* and *Euterpe* and 2,000yd from *Climene*, *Sahib* (**6**), badly damaged by *Euterpe*'s attack, is fired on by all three Italian ships and attacked by two Ju 88 aircraft firing machine guns. All Italian shells miss. The 100mm gun on board *Euterpe* fires 15 rounds, but because the ship is closing so fast it is not a stable gun platform and there are no hits. Bromage scuttles *Sahib*.

0615hrs: By this time *Sahib*'s crew, except Engine Artificer E.G. England, are rescued (40 by *Climene* and six by *Gabbiano*).

LEFT This map shows the 24 April 1943 engagement of the S-class submarine *Sahib* with the Spica-class torpedo boat *Climene* and the Gabbiano-class corvettes *Gabbiano* and *Euterpe*, which (along with the Giuseppe La Masa-class *Angelo Bassini*) were escorting the merchantman *Galiola* off Capo di Milazzo, Sicily. When *Sahib* torpedoed *Galiola*, *Angelo Bassini* picked up survivors while *Climene*, *Gabbiano* and *Euterpe* approached the submarine, according to the tracks shown.

OVERLEAF *Sahib* has endured a depth-charge attack by *Euterpe*'s Gatteschi system and a small hole has appeared in the stern, forcing Lieutenant Bromage to surface the submarine 800yd behind *Euterpe*, which has turned to begin another attack run. A pillar of smoke and water has shot up 100yd from *Sahib* as the submarine is now the target for the 100mm guns from three Italian torpedo boats – *Euterpe*, *Gabbiano* and *Climene*. *Gabbiano* is visible 800yd behind *Sahib*, having earlier made its own attack on the submarine. Two Ju 88s that dropped bombs earlier to locate the submarine for the torpedo boats are also circling to make a strafing run.



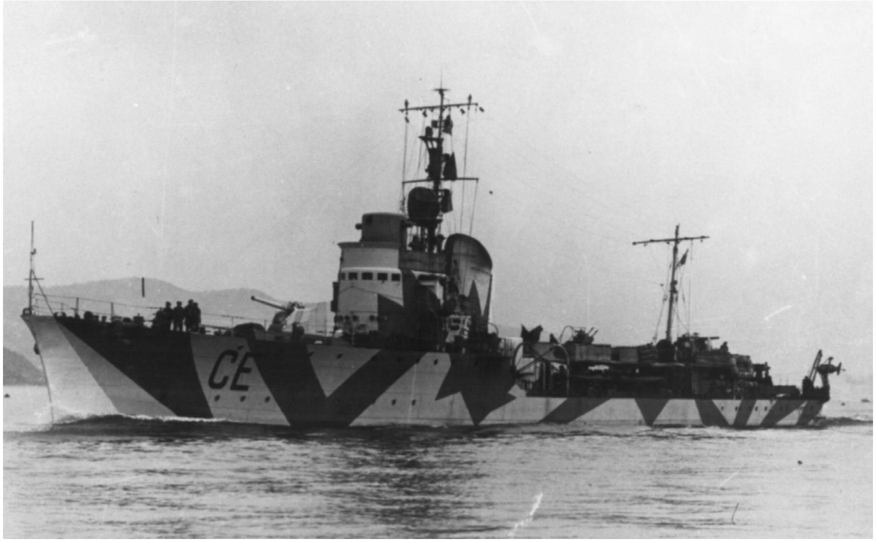


MAY–SEPTEMBER 1943

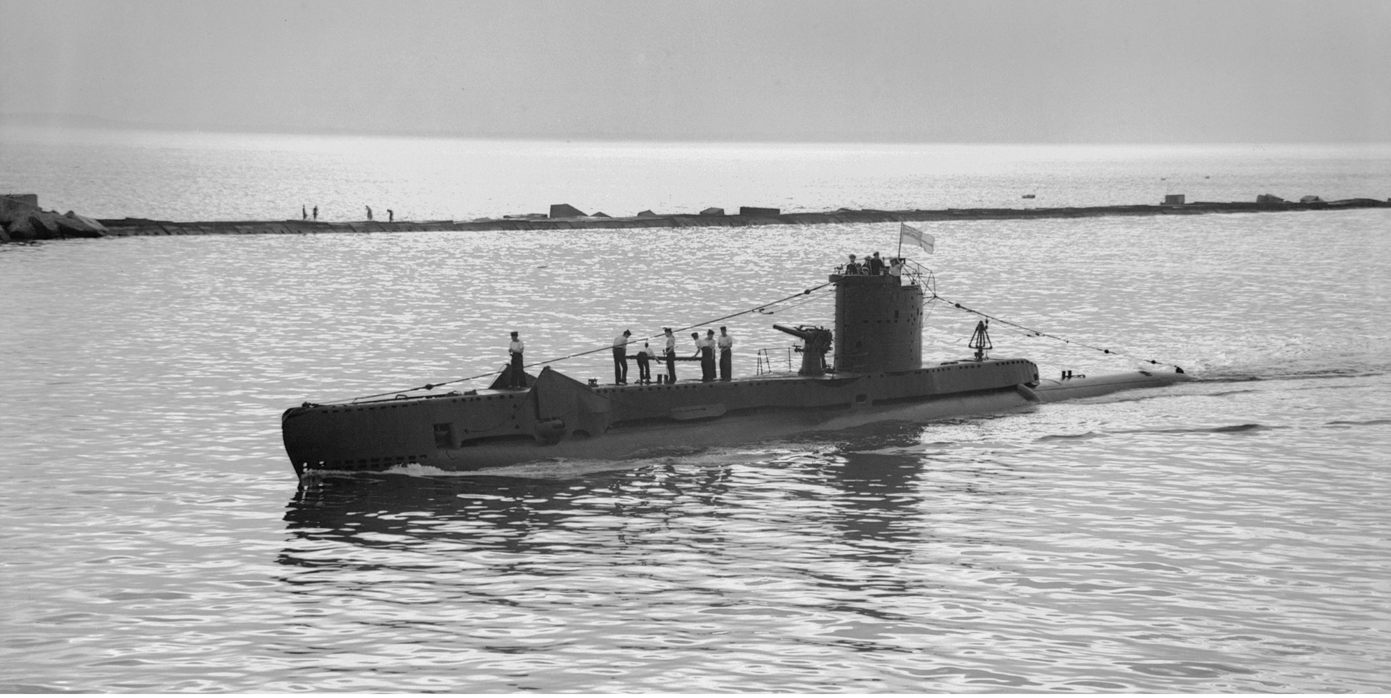
The Axis forces in Tunisia capitulated on 12 May, and attention turned to the defence of Sicily from the threat of invasion in July. British submarines operated more freely, ranging across the Italian coastline; even so, the Regia Marina was still capable of inflicting losses, especially with the new Gabbiano-class corvettes. Up to the invasion of the Italian mainland, smaller Italian ships were the only ones capable of operations because larger ships had no fuel to spare.

On 7 August, *Saracen* (Lieutenant M. Lumby) departed Algiers to operate off Corsica. On 13 August, on the approach to Bastia, Lumby described 'a hot, still day, with the sea like glass, and rather hazy. Asdic conditions were appalling'; he watched the harbour and 'The odd patrol vessel was seen but with the bad Asdic conditions no HE was heard, nor were any Asdic transmissions. Once a seaplane landed with its floats astride the periscope' (quoted in Evans 2010: 372). After reports of a submarine sighting, *Minerva* (Tenente di Vascello Marco Baroglio) and *Euterpe* (Tenente di Vascello A. March) departed Bastia. At 0014hrs on 14 August, Baroglio recorded an ECG contact 765yd away at 270 degrees and turned 90 degrees to port, ordering slow engines. The ECG was again heard at 310 degrees at 820yd. Baroglio turned 'to port a further 50° and at the end of the turn stopped engines to avoid cutting the distance of the obstacle to less than 400 metres [435yd]. From 0022 to 0040 the ECG continued to beat on the obstacle while I maintained practically a constant course' (quoted in Evans 2010: 373). He was sure a submarine was moving 'about 3 knots on a course equal to mine and at a distance of about 700 metres [765yd]', sped up to 14kn to attack, and at 0046hrs 'discharged four salvoes of eight depth charges plus two more salvos of four depth-charges each' (quoted in Evans 2010: 373).

Stoker Edward Metcalfe was not surprised they were sighted, 'as from there I could have seen a periscope ten or twelve miles away owing to the placidness of the water' (quoted in Evans 2010: 376). Lumby reported how the attack 'was all



Here is *Climene*, the Spica-class torpedo boat also shown on page 5, as she appeared later in the war with camouflage paint scheme applied. On 27 April 1943, the Spica-class *Climene* (Tenente di Vascello Mario Colussi) departed Trapani. At 1030hrs on 28 April, soon after meeting two German transports off Marsala, *Climene* was hit and sunk by a torpedo from *Unshaken* (Lieutenant J. Whitton) 25 miles south-west of Marettimo Island. Three torpedoes were launched and *Climene* was hit by the second. Tenente di Vascello Mario Colussi and 90 other survivors were rescued; 53 crewmen died. *Climene* had conducted 100 wartime missions. Forwarding the patrol report, Simpson noted: 'it is my opinion that these shallow draught destroyers should not normally be attacked. Orders to this Flotilla are being issued accordingly' (Simpson 2010: 107). (USMM)



Ultor pictured at Algiers, returning from patrol. *Lince* had gone aground off Punta Alice, Taranto, on 4 August. In the early morning of 28 August, Lieutenant G. Hunt, now captain of *Ultor*, observed the torpedo boat undamaged with stern afloat, tug in attendance, and Italians trying to dislodge the bow from the beach. He closed using ASDIC in active mode and at 0815hrs fired a single torpedo from 900yd. The hull under the mainmast was hit; Italians manning the bow 100mm gun fired rounds at *Ultor*'s periscope that did no damage. Before departing, Hunt commented how 'we have saved the Italians from a hot day's work' (quoted in Dornan 2013: 89). (© IWM A 16888)

extremely noisy, but not too bad', until 'the final charge which was very close and made the boat whip in an alarming manner, such as I had not met before. The helmsman reported that the shaft to the steering wheel had sheared'; Metcalfe described how in the stokers' mess deck the plates sprung above the compressors and water poured in. According to Lumby, the 'EO (engineer officer) was sent to stuff his socks in the leak, but he returned to say that the after-ends were flooded' (quoted in Wingate 1991: 326). Then, according to Metcalfe, 'The bulkhead door was ordered shut, and the after ends were then sealed off. With the weight of the water in the stern, the captain had great difficulty in holding trim. This sent the boat through the water stern-down at 45°' (quoted in Evans 2010: 374). Lumby described 'a considerable bow-up angle. We attempted to correct this with main ballast trimming but it was not very successful. We porpoised up and down and used up a lot of air' (quoted in Evans 2010: 373).

At 0053hrs, Baroglio – 710yd away – observed the conning tower before it disappeared and temporarily regained ECG contact at 490yd distance; then, at 0059hrs at 310 degrees and a distance of 545yd, 'the submarine emerging slightly on her side. I ordered the gun and machine-gun to open fire. The shooting was bang on target' (quoted in Evans 2010: 374). Metcalfe climbed out of the conning tower and later noted that with the tracer 'it was as colourful as Blackpool' (quoted in Evans 2010: 375). Hit by 20mm shrapnel, he swam for it. Baroglio followed the submarine until it sank before returning to pick up survivors. When he approached, Lumby reported 'Loud whistles attracted her attention and she stopped and picked us up' (quoted in Evans 2010: 374). He observed some Italian crewmen wounded by fire from *Euterpe* and given brandy and coffee. Stoker Petty Officer Ward and Able Seaman Downer – both non-swimmers – were missing.

With the announcement of the Italian Armistice on 8 September 1943, the Regia Marina would no longer be fighting alongside German forces, but the war continued and many torpedo boats would serve guarding Allied convoys from attacks from the Germans.

STATISTICS AND ANALYSIS

OPPOSITE This map shows the locations of all definite and suspected British submarine sinkings by Italian torpedo boat or corvette, and all definite and suspected Italian torpedo-boat and corvette sinkings by British submarine. These occurred predominantly at the approaches to the departure and arrival ports of Italian convoys: off Libya and Tunisia, near the Strait of Messina and also in the Adriatic and Aegean seas.

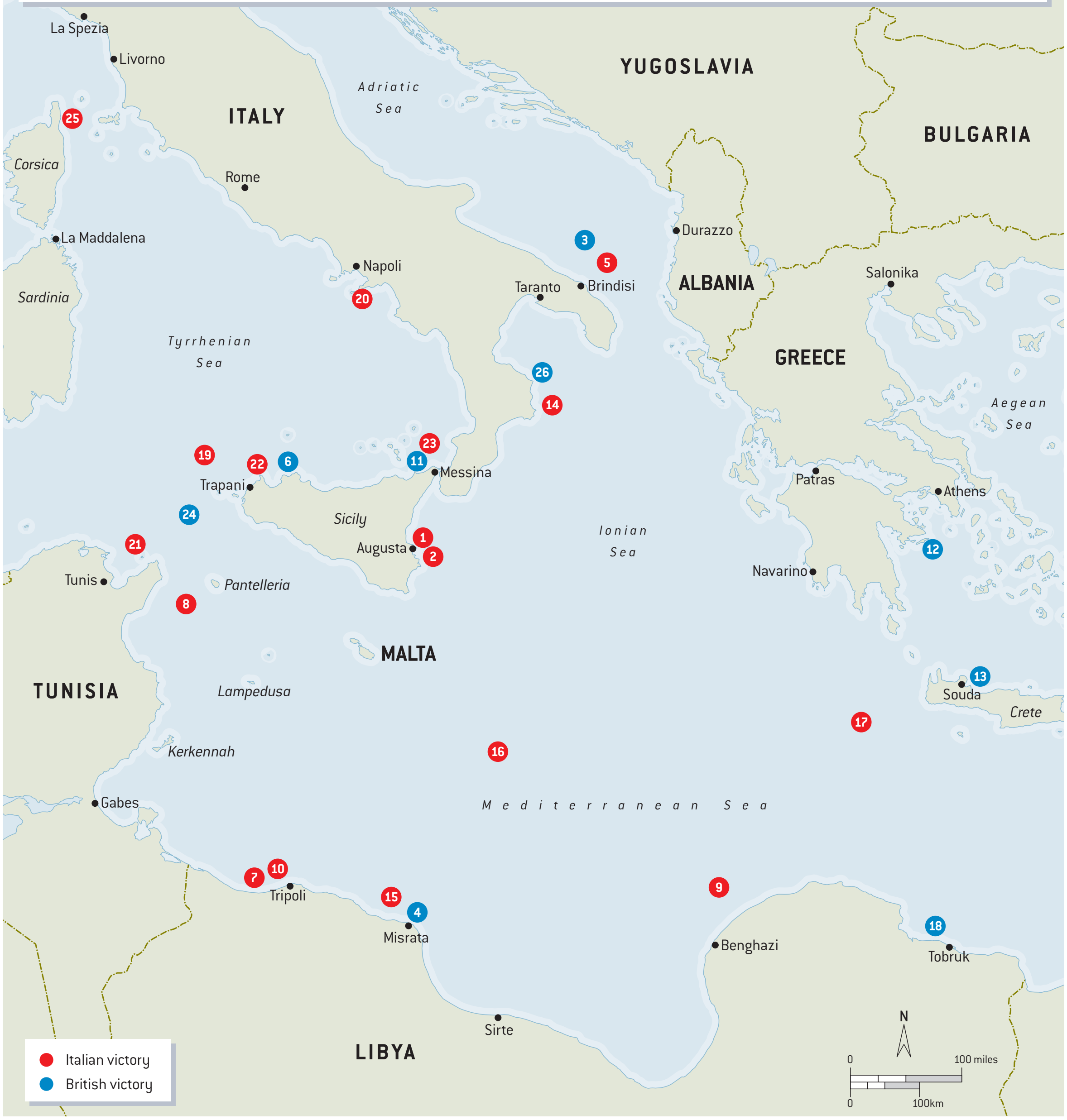
According to the historian Marc Bragadin, in the period 10 June 1940–8 September 1943 the Italians utilized 6,532 convoys (11,085 cargo ships and 5,069 escorts). The majority (4,807 convoys) were sent to Albania and Greece. From October 1940 to April 1941, 516,440 men and 510,688 tons of supplies were successfully landed in Albania, escorted by two destroyers and ten torpedo boats. Another five torpedo boats were added, and cruiser divisions patrolled to ward off the Royal Navy. Italian losses were slight: eight merchantmen and two torpedo boats.

The Axis army in Libya needed 70,000 tons of supplies per month, and on average this was met in February–June 1941. Losses in matériel were about 6.6 per cent during this time. Then, from July 1941, Britain received ‘advance notice of virtually every convoy and important independent ship that sailed with troops or supplies across the Mediterranean’ (O’Hara, Dickson & Worth 2014: 137) because the Italian machine cipher C38m had been broken. By September 1941, Italian oil reserves were exhausted and the British squadron on Malta posed an increasing threat. That month, 30 per cent of matériel shipped to Africa was lost; in November the figure rose to 50 per cent. In mid-December, as the Axis forces retreated, the supply situation was critical.

At the end of 1941, however, the momentum shifted in favour of the Axis. The Italian battle fleet was mustered to break the blockade, and the First Battle of Sirte (17 December) was an Italian success. Britain’s surface units were not able to interdict the convoy route; instead, aircraft and submarines were relied upon to attack the Axis sea-lanes to Libya. From January to July 1942 only 15 Axis merchant ships were lost (ten to submarine activity). Despite ten ships (59,972 GRT) being sunk in August (six to

Sinkings arising from submarine and torpedo-boat clashes, 10 June 1940–8 September 1943

1. *Polluce* sank *Grampus*, 16 June 1940
2. *Albatros* probably sank *Phoenix*, 16 July 1940
3. *Osiris* sank *Palestro*, 22 September 1940
4. *Rorqual* laid mines that sank *Calipso*, 5 December 1940, and *Fratelli Cairoli*, 23 December 1940
5. *Clio* may have sank *Triton*, 18 December 1940
6. *Rorqual* laid mines that sank *Generale Antonio Chinotto*, 28 March 1941
7. *Pegaso* may have sunk *Undaunted*, 12 May 1941
8. *Circe* sank *Union*, 20 July 1941
9. *Generale Achille Papa* rammed *Cachalot* leading to its scuttling, 30 July 1941
10. *Partenope* may have sunk *P 33*, 18 August 1941
11. *Upright* sank *Albatros*, 27 September 1941
12. *Rorqual* laid mines that crippled *Altair*, 19 October 1941, and sank *Aldebaran*, 20 October 1941
13. *Truant* sank *Alcione*, 11 December 1941
14. *Circe* sank *Tempest*, 13 February 1942
15. *Circe* sank *P 38*, 23 February 1942
16. *Pegaso* may have sunk *Upholder*, 14 April 1942
17. *Pegaso* sank *Thorn*, 6 August 1942
18. *Porpoise* laid mines that sank *Generale Antonio Cantore*, 22 August 1942
19. *Groppo* may have sunk *Utmost*, 25 November 1942
20. *Fortunale* sank *P 222*, 12 December 1942
21. *Ardente* sank *P 48*, 25 December 1942
22. *Cicogna* sank *Thunderbolt*, 14 March 1943
23. *Euterpe*, *Gabbiano* and *Climene* holed *Sahib*, leading to its scuttling, 24 April 1943
24. *Unshaken* sank *Climene*, 28 April 1943
25. *Euterpe* and *Minerva* holed *Saracen*, leading to its scuttling, 14 August 1943
26. *Ultor* sank *Lince*, 28 August 1943


La Spezia
Livorno
ITALY
Adriatic Sea
YUGOSLAVIA
BULGARIA
Corsica
Rome
La Maddalena
Sardinia
Napoli
Taranto
Brindisi
Durazzo
ALBANIA
Salonika
GREECE
Tyrrhenian Sea
Aegean Sea
Trapani
Messina
Patras
Athens
Sicily
Augusta
Ionian Sea
Navarino
Tunis
Pantelleria
MALTA
TUNISIA
Lampedusa
Souda
Crete
Kerkennah
Gabes
Mediterranean Sea
Tripoli
Misrata
Benghazi
Tobruk
Sirte
LIBYA
25
3
5
20
26
14
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23
11
24
21
1
2
12
8
13
17
16
10
7
15
4
9
18
N
0
100 miles
0
100km
● Italian victory
● British victory

submarines and four to aircraft), only five (12,475 GRT) were lost in September, though nine (40,012 GRT) were lost in October (six to submarines) and nine (27,637 GRT) in November (none to submarines). In August 1942 – a decisive month for the ground campaign – 70 per cent of supplies arrived; Axis forces, halted at El Alamein, received the majority from Benghazi by truck, because Tobruk was damaged and under air attack. Rommel cited enemy minefields and enemy superiority as more important factors than lack of fuel for his defeat on the ground. In total, 2,249 cargo ships in 1,210 convoys escorted by 1,913 escorts were sent on supply runs to Libya. Between June 1940 and December 1942, 1,929,955 tons of matériel and 189,198 men were landed in Libya, with only 14 per cent and 8.4 per cent, respectively, failing to arrive.

In the period November 1942–April 1943, 306,721 tons of matériel and 72,246 men were landed in Tunisia, with 27.9 per cent and 7 per cent, respectively, failing to arrive. Losses to Axis shipping (merchant and naval) were severe. According to Bragadin, 243 ships (151 over 500 GRT) were sunk and 242 damaged; 5 per cent due to surface action, 7 per cent to mines, 8 per cent to submarines, 13 per cent scuttled or abandoned in port and 67 per cent to air action (by this point the decisive arm with 273 air raids made on Tunisian ports). Sadkovich states that 339 of 489 ships lost to aircraft in 1940–43 were lost in port. In 1941, while 636 air raids on Italian ports sank only 12 merchantmen, in 1942 this figure increased to 42 and in 1943 to 249.

Sinkings of Axis merchant ships, 10 June 1940–8 September 1943

Reason	**Number**
Sunk by aircraft	489 (37 per cent)
Sunk by submarine	324 (25 per cent)
Sunk for unknown reason or causes other than military	290 (22 per cent)
Scuttled due to evacuation of ports	82 (6 per cent)
Sunk by mines	80 (6 per cent)
Sunk by surface ships	59 (4 per cent)
Total	*1,324*

British submarines were integral to but only part of the Allied campaign to interdict Axis supplies in the Mediterranean theatre. From October to December 1941, out of the 27 Axis merchant ships lost, seven were sunk by submarines. The proportion rose to 10 out of 15 from January to June 1942, but then fell again in July to August (six out of 13) and October to November (six out of 18). Furthermore, as the war progressed, the ratio of tonnage sunk by submarines to submarines lost fell rather than rose.

This was not for want of effort by Britain. From January to June 1941 there were 80 submarine missions, spending a total of 1,000 days at sea, with 90 per cent of their attacks against convoys – 65 per cent on those to North Africa and 25 per cent in the Tyrrhenian, Aegean and Adriatic; during July to December 1941 the number of missions doubled. According to Rauber, submarines launched a total of 586 attacks between June 1940 and September 1943, with 319 being successful. On average, 3.1 torpedoes were used in each attack, hitting 15 per cent of the time. Two-thirds of submarine attacks were in daylight hours.

British submarine losses by class, 10 June 1940–8 September 1943

Class (number deployed to the Mediterranean)	**Destroyer**	**Torpedo boats and corvettes**	**Aircraft**	**Mines**	**Other**	**Total**
O class (6)	2	0	0	2	0	4
P class (5)	0	1	1 (Italian)	2	0	4
R class (4)	0	0	0	2	1 (collision)	3
River class (2)	0	0	0	0	0	0
S class (12)	0	2 (1 to a German corvette)	0	0	2 (scuttled)	4
T class (23)	0	4 (1 to a German corvette)	0	5	1 (submarine); 1 (cause unknown)	11
U class (35)	0	3	3 (2 German, 1 Italian)	2	4 (causes unknown)	12
Grampus class (4)	0	2	0	0	0	2
Total (91)	*2*	*12*	*4*	*13*	*9*	*40*

Torpedo-boat losses by class, 10 June 1940–8 September 1943

Class (number deployed to the Mediterranean)	**Submarine**	**Aircraft**	**Surface**	**Mines**	**Other**	**Total**
Rosolino Pilo (7)	0	0	0	2 (1 to mines laid by *Porpoise*, 1 to mines laid by *Rorqual*)	0	2
Giuseppe Sirtori (4)	0	1	0	0	1 (scuttled)	2
Giuseppe La Masa (7)	0	2	0	1	0	3
Palestro (4)	1	0	0	0	1 (collision)	2
Curtatone (4)	0	0	0	1	0	1
Generali (6)	0	0	0	3 (1 due to mines laid by *Porpoise*, 1 due to mines laid by *Rorqual*)	0	3
Albatros (1)	1	0	0	0	0	1
Spica (30)	3	7	7	3 (all to mines laid by *Rorqual*)	1 (collision)	21
Ariete (1)	0	0	0	0	0	0
Orsa (4)	0	0	0	0	0	0
Ciclone (16)	0	2	0	2	1 (collision); 1 (scuttled)	6
Gabbiano (29)	0	0	0	2	1 (ran aground)	3
Total (113)	*5*	*12*	*7*	*14*	*6*	*44*

According to Sadkovich (1994), of 34,094 Italian naval missions in the period 10 June 1940–8 September 1943, 16,735 (49 per cent) were devoted to protecting convoys. A large proportion of the Regia Marina's fuel oil was burned by torpedo boats (34 per cent) and destroyers (42 per cent), with torpedo boats logging 45 per cent of total mileage of all major naval surface vessels (over 3.4 million miles) and destroyers 30.5 per cent.

Of 200 ASW actions in a sample analysed by Supermarina, 60 per cent were conducted during convoy operations. In the 20 months before ECG was installed (10 June 1940–January 1942), Supermarina judged 35 per cent of ASW attacks successful; in the subsequent 19 months (February 1942–8 September 1943), 65 per cent. ECG certainly added to the lethality of the attacks, and Italian performance improved as the war went on as a result of experience gained. Furthermore, SIS warnings enabled attacks to be avoided or met when fully prepared.

The importance of aircraft to the safety of Axis convoys was also apparent: for example, from 1 April to 15 September 1941, of eight Axis ships sunk by Allied submarines, five had no air escort. Some 100 aircraft a month were used to protect convoys, and ships were lost in only seven convoys under their protection – but the Regia Aeronautica had few aircraft that could contact convoy escorts to report the whereabouts of a submarine. If a convoy changed course it was difficult for a new shift of aircraft to locate it, especially if low cloud or mist limited visibility; furthermore, pilots were used who had no marine-navigation training, which meant that sometimes they did not find the convoy they were supposed to escort.

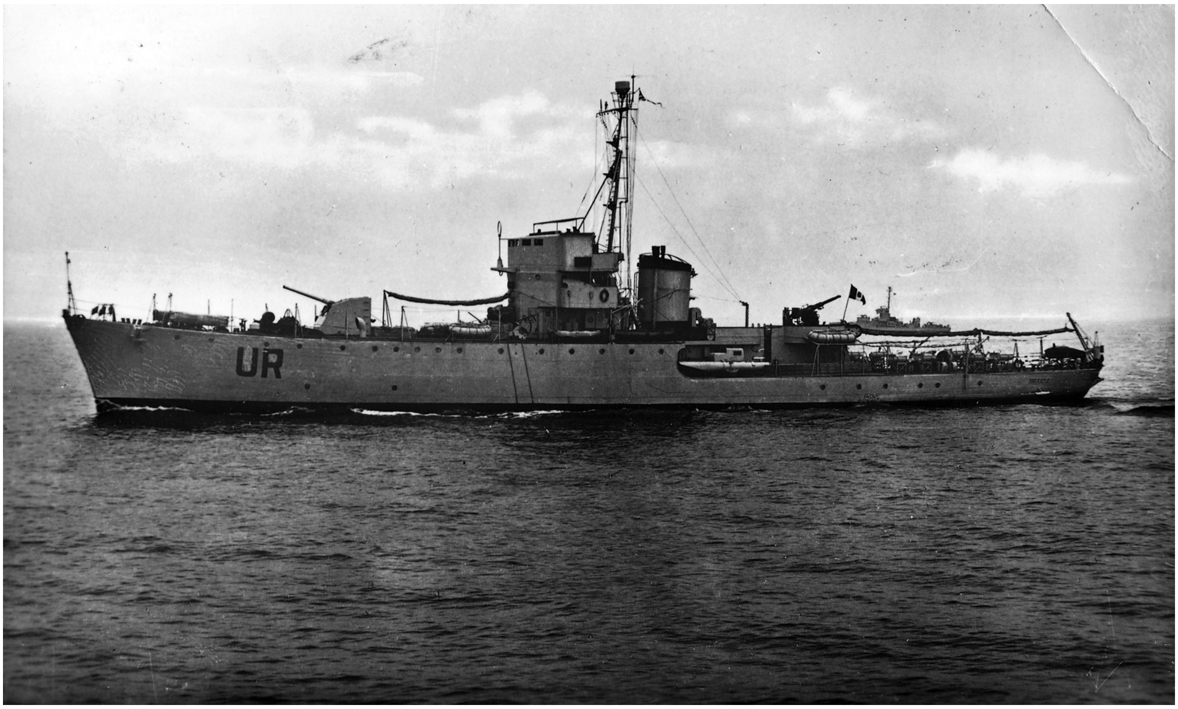
AFTERMATH

In September 1943, the Germans seized many of Italy's surviving torpedo boats. All those that reached Allied bases subsequently served as escorts to Allied convoys, and those that were still building fell into German hands. Of the 16 Ciclone-class vessels, *Impavido*, *Intrepido* and *Ardito* served with German crews. Twelve Ariete-class vessels were completed by the Germans and used during operations – all were sunk, the majority by aircraft. Of the Spica-class vessels, one (*Partenope*) was scuttled after the Armistice, and seven (*Aretusa*, *Calliope*, *Cassiopea*, *Clio*, *Libra*, *Sagittario* and *Sirio*) survived to serve in the post-war Marina Militare. Only *Lira* served with the Germans – from La Spezia – and was sunk. Nine Gabbiano-class vessels (*Vespa*, *Tuffetto*, *Marangone*, *Strolaga*, *Artemide*, *Persefone*, *Camoscio*, *Antilope* and *Renna*) operated off southern France and northern Italy, as did five Ariete-class and the three Ciclone-class vessels. In the Adriatic were two Rosolino Pilo-class, seven Ariete-class and four Gabbiano-class vessels (the latter being *Egeria*, *Melpomene*, *Colubrina* and *Spingarda*), and in the Aegean were two Palestro-class and two Curtatone-class vessels.

After September 1943, British submarines did not experience the rate of loss that occurred against the Italians, despite the German seizure of Italian torpedo boats. Axis ASW operations were more limited, as the Germans no longer had the need to send as many supply convoys. On 1 October 1943, *Usurper* was sunk, probably by *UJ 2209* (an ex-French ship under German command) in the Gulf of Genoa; *Trooper* was lost on mines in the Aegean in mid-October, as was *Simoom* on 4 November, and *Sickle* in June 1944.

The defeat of Italy permitted Royal Navy submarine operations to expand in the Far East. Operations from Ceylon centred on interdicting smaller Japanese resupply ships, especially on the surface with deck guns, operating along the coast to Burma.

OPPOSITE *Safari* (Commander B. Bryant until April 1943, then Lieutenant R. Lakin) was commissioned in March 1942 and arrived at Gibraltar in May. The submarine carried out 14 missions in the Mediterranean before returning to Portsmouth on 8 September 1943. On 26 July 1943, Lakin attacked the Italian (ex-French) merchant ship *Saluzzo*, escorted by the Ciclone-class torpedo boats *Ardito* and *Animoso* while sailing from Napoli to Sardinia. Lakin missed with two separate salvoes of three torpedoes and survived a depth-charge attack from *Ardito* of 14 depth charges in 95 seconds. On 9 June *Ardito*, on passage from Sardinia to Napoli, had spotted *Safari* on the surface at night at 3,300yd and sped over to launch six depth charges, claiming to have sunk the submarine. *Safari* survived the attack and Lakin reported the use of ASDIC by *Ardito*. *Safari* was a very successful submarine having sunk, among others, eight merchant ships, a tanker, two transports, six sailing ships, five minesweepers and a minelayer. (Cody Images)



A total of 29 Gabbiano-class vessels were completed before the Armistice; 24 would subsequently be given German designations (five were seized operationally ready, ten were completed and nine remained uncompleted by the end of the war). None of those completed survived, but 14 were used as patrol ships by the post-war Marina Militare, some until 1972. Here is *Urania* in the 1950s. (Author's collection)

In late 1944, the 8th Submarine Flotilla was transferred to Fremantle on the south-west coast of Australia and operated in the Java Sea, while the 4th Submarine Flotilla and the newly created 2nd Submarine Flotilla remained in Ceylon. By March 1945, the Strait of Malacca was closed off to Japanese ships and in April the 8th Submarine Flotilla, replaced at Fremantle by the 4th, moved to the Philippines. By then there were 38 British and Dutch submarines in the Far East with four more due. There were four losses: in March 1944 *Stonehenge* was overdue and declared lost (presumed mined); on 22 November *Strategem* was depth-charged in the Strait of Malacca and scuttled; on 3 January 1945 *Shakespeare* was damaged by gunfire and air attack and written off; and on 19 May *Terrapin* was damaged by depth charges in the Java Sea and also written off.

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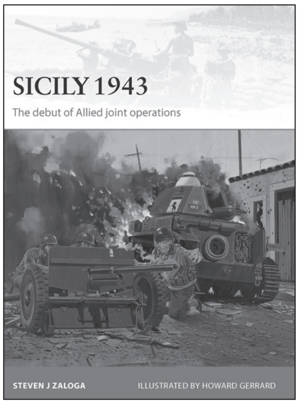
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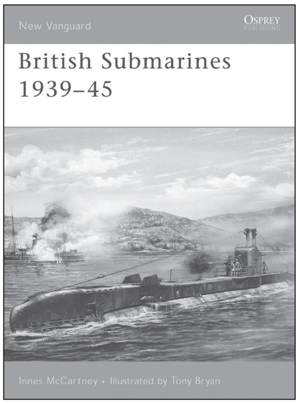
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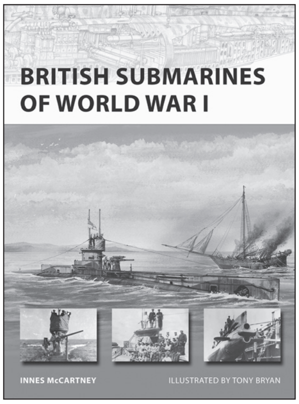
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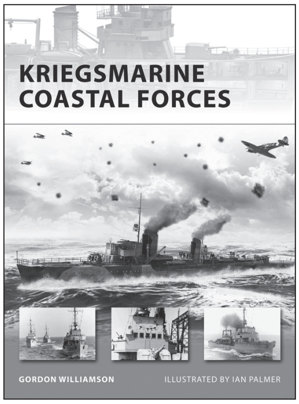
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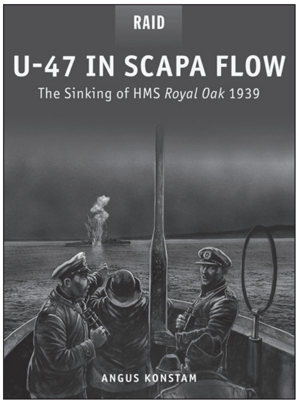
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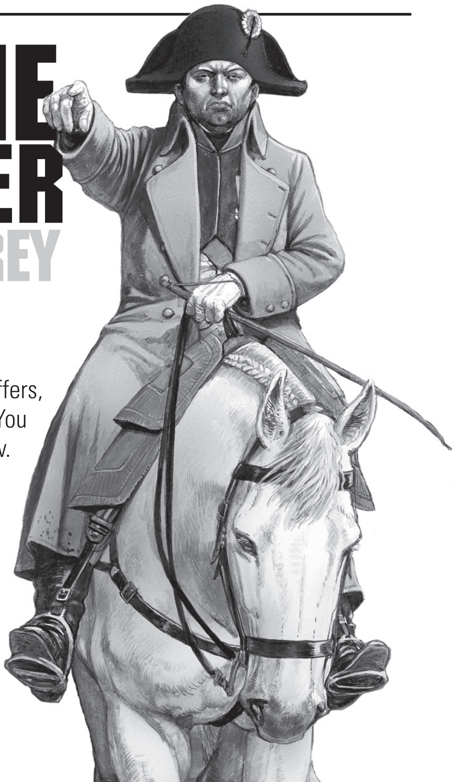

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